

NEW RECORDS OF ISOPOD CRUSTACEA FROM THE CARIBBEAN, THE FLORIDA KEYS, AND THE BAHAMAS

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Abstract. — Fourteen species of marine isopods are recorded from Belize, the Bahamas, and the Florida Keys. These include a new genus and species of anthuridean, *Licranthura amyle*, resembling the genera *Eisothistos* and *Stellanthura*, and characterized mainly by the presence of antler-like processes on the antennae, and the following new species: *Mesanthura looensis* (Anthuridae), *Phycolimnoria clarkae* (Limnoriidae) (apparently the first record of the genus found in decaying wood), *Cirolana albidoida*, *Cirolana crenulitelson* (Cirolanidae), *Ancinus belizensis*, and *Cassidinidea mosaica* (Sphaeromatidae). Six species of *Limnoria* are recorded as co-occurring: *L. multipunctata*, *L. pfefferi*, *L. platycauda*, *L. tuberculata*, *L. indica*, *L. unicornis*. Of these, the latter two are recorded from the Caribbean for the first time. *Cirolana minuta* Hansen is redescribed, this being the second record of the species.

Since the appearance of the work by Menzies and Glynn (1968) on the isopod fauna of Puerto Rico (and which summarized knowledge of the Caribbean isopodan fauna), several papers have appeared dealing with aspects of the marine isopod fauna of the area. Careful, small-scale collecting aided by SCUBA have added considerably to the Caribbean faunal list (e.g., Kensley 1982, 1984), and will no doubt continue to do so, as witness this present paper. The surprising and unsuspected richness of the isopod fauna is well illustrated by the growing number of new species and records coming from a relatively small area around the Smithsonian Institution's field laboratory on Carrie Bow Cay, Belize.

Unless otherwise indicated, all material dealt with in this paper was collected by the authors.

Family Anthuridae *Licranthura*, new genus

Diagnosis. — Pleonites 1-5 short, free. Telson lacking statocysts. Tailfan cup-like, expanded, margins serrate, uropodal exo-

pod with spike-like lobe. Antennular flagellum of 3 articles, terminal article with 2 aesthetascs. Antennal peduncle article 3 with serrate triangular process, flagellum of 6 articles. Mandible lacking molar process. Maxilliped palp of 5 articles. Pleopod 1, rami separate, together forming operculum. Pereopod 1, propodus somewhat enlarged, larger than pereopods 2 and 3.

Remarks. — The lack of statocysts and a mandibular molar, the spike-like lobe on the uropodal exopod, the serrate tailfan margins, the free anterior five pleonites, the non-subchelate pereopod 1, the poorly developed opercular pleopod 1 with both rami contributing, all point to a similarity to two genera, *Eisothistos* Haswell, 1884, and *Stellanthura* Wägele, 1979. *Licranthura* differs from both in several aspects. *Eisothistos* possesses fused rami of pleopod 1, lacks a mandibular palp, and has pereopod 1 of about the same size as pereopods 2 and 3. *Stellanthura* possesses a mandibular palp, a reduced molar, and four articles in the maxillipedal palp. Neither of these genera possess the unusual serrate lobe of the third

peduncular article of the antenna. The function of these structures can only be speculated on: possibly it is related to some feeding behavior. The splayed and serrate tailfan would suggest that this species also preys on some tubicolous organism as does *Eisothistos*.

Etymology.—The generic name is derived from the Greek *likros*, an antler (referring to the structures on antennae), plus the commonly-used suffix “anthura.”

Licranthura amyle, new species

Figs. 1, 2

Material.—HOLOTYPE, USNM 211408, ♀ tl 3.2 mm; sta H-15, Carrie Bow Cay, Belize, from *Agaricia* coral in forereef crest, 15 m, 20 Apr 1981, coll. G. Hendler.

PARATYPES, USNM 211409, ♀ tl 3.8 mm; sta H-1, Twin Cays, Belize, *Caulerpa* alga around red mangrove roots, 0–2 m, 17 Apr 1981, coll. G. Hendler.—USNM 211410, manca tl 1.9 mm; sta H-7, off Glover's Reef, Belize, 15–21 m, 24 Mar 1980, coll. G. Hendler.—USNM 211411, ♀ tl 2.8 mm; sta H-8, Carrie Bow Cay, Belize, from *Madracis* coral on forereef crest, 15.2 m, 19 Apr 1981, coll. G. Hendler.—USNM 211412, 3 ♀ tl 3.1, 3.5, 3.6 mm; sta H-11, Carrie Bow Cay, Belize, from *Madracis* coral on forereef crest, 15.2 m, 19 Apr 1981, coll. G. Hendler.—USNM 211412, ♀ tl 2.8 mm; sta H-16, Carrie Bow Cay, Belize, from *Agaricia* coral on forereef crest, 15.2 m, 20 Apr 1981, coll. G. Hendler.—USNM 211414, ♀ tl 3.0 mm; sta H-41, Carrie Bow Cay, Belize, from *Agaricia* on reef platform, 1–2 m, 25 Apr 1981, coll. G. Hendler.—USNM 211415, manca tl 1.9 mm; sta H-49, Carrie Bow Cay, Belize, from *Porites* coral on reef flat, 1–2 m, 26 Apr 1981, coll. G. Hendler.—USNM 211416, 2 ♀ tl 2.5, 2.8 mm; sta H-85, Carrie Bow Cay, Belize, from coral rubble and algae on forereef dropoff, 24.4–27.4 m, 21 Apr 1981, coll. G. Hendler.—USNM 211417, 2 ♀ tl 2.8, 3.0 mm; sta K-101, Carrie Bow Cay, Belize, coral rubble

near drop-off, 25 m, 14 Apr 1981.—USNM 211418, ♀ tl 3.8 mm; sta K-142, Carrie Bow Cay, Belize, lower spur and groove zone, 11 m, 5 Dec 1982.—USNM 211419, ♀ tl 3.9 mm; sta K-162, between Carrie Bow Cay and South Water Cay, Belize, coral rubble from patch reef area, 6–8 m, 27 Nov 1985.

Description.—Female: Body slender, about 12 times longer than wide, widest at pereonite 1. Faint diffuse brown pigment most noticeable on dorsolateral margins of somites; cephalon with faint dorsal reticulation. Body proportions: $C < 1 > 2 = 3 < 4 = 5 > 6 > 7$. Pleonites short, similar in length. Telson thin, dorsally faintly concave, basally narrow, widening posteriorly to truncate or faintly bilobed serrate posterior margin.

Cephalon with small well pigmented eyes. Antennular peduncle of 3 articles, basal article longest and widest; flagellum of 3 articles, article 2 about 5 times length of terminal article, latter bearing 2 aesthetascs. Antennal peduncle with article 3 produced mediolaterally into triangular process bearing 6 serrations on medial margin, process reaching distally beyond article 4, latter with medial margin flexed, resulting in article 5 and flagellum being borne at right angle to axis of body; flagellum of 6 setose articles. Mandibular palp of 3 articles, article 2 three times length of article 3, latter bearing 2 fringed spines distally; incisor of 3 blunt cusps directed anteriorly; lamina dentata of 5 marginal serrations; molar absent. Maxilla bearing 7 distal spines. Maxilliped with short endite tipped with 2 setules; palp of 5 articles, basal article very short, terminal article small, bearing 4 elongate setae.

Pereopod 1 larger than pereopods 2 and 3; dactylus articulating distally on propodus, with strong sclerotized unguis having smaller squat spine, thin-walled elongate spine, and 4 slender setae at its base; posterior margin having finely fringed ridges; propodus basally slightly broader than distally, having 2 fringed spines anterodistally and few elongate setae on posterior margin;

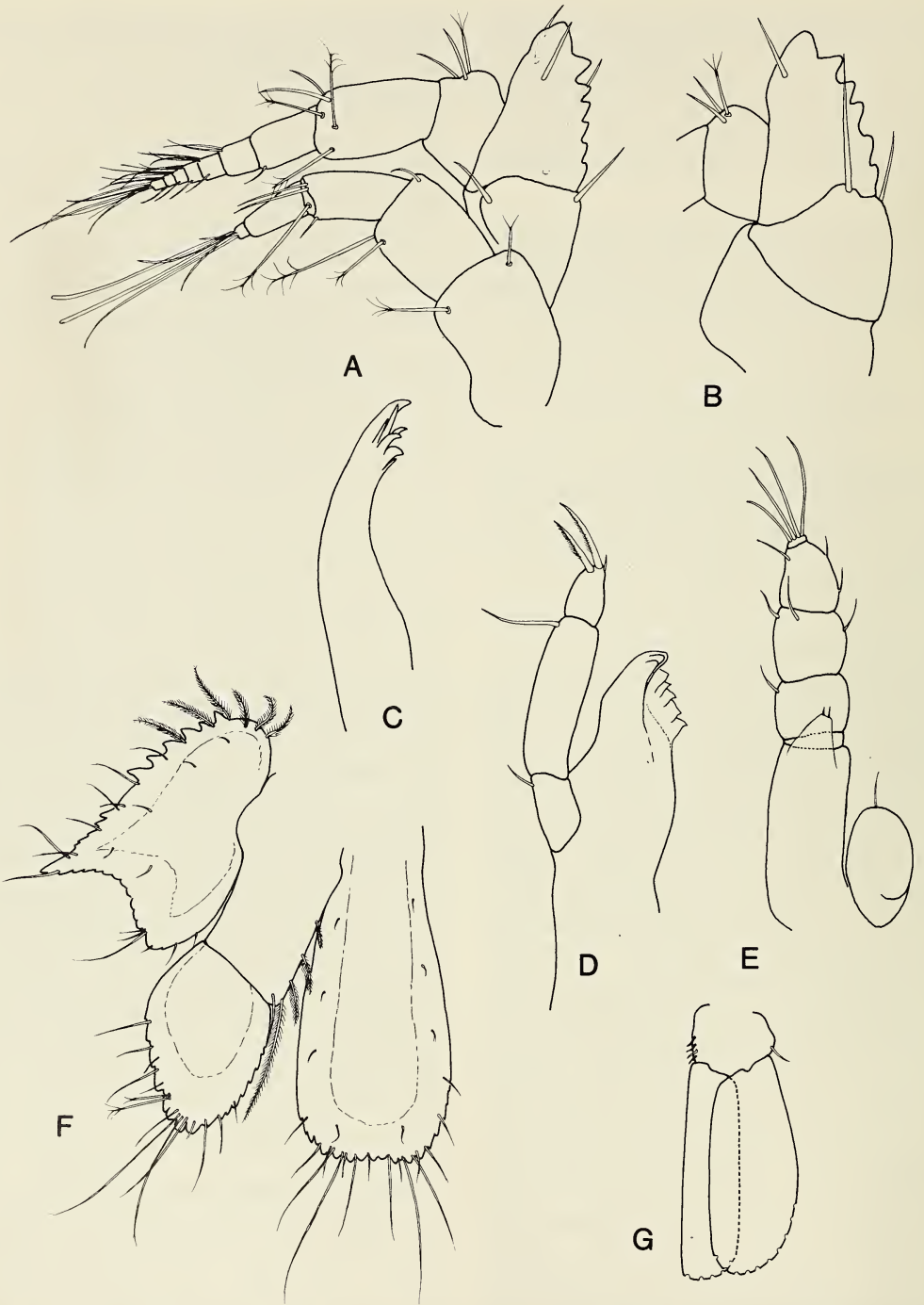


Fig. 1. *Licranthura amyle*, non-ovigerous ♀: A, Antennule and antenna; B, Antennal process enlarged; C, Maxilla; D, Mandible; E, Maxilliped; F, Uropod and telson; G, Pleopod 1.

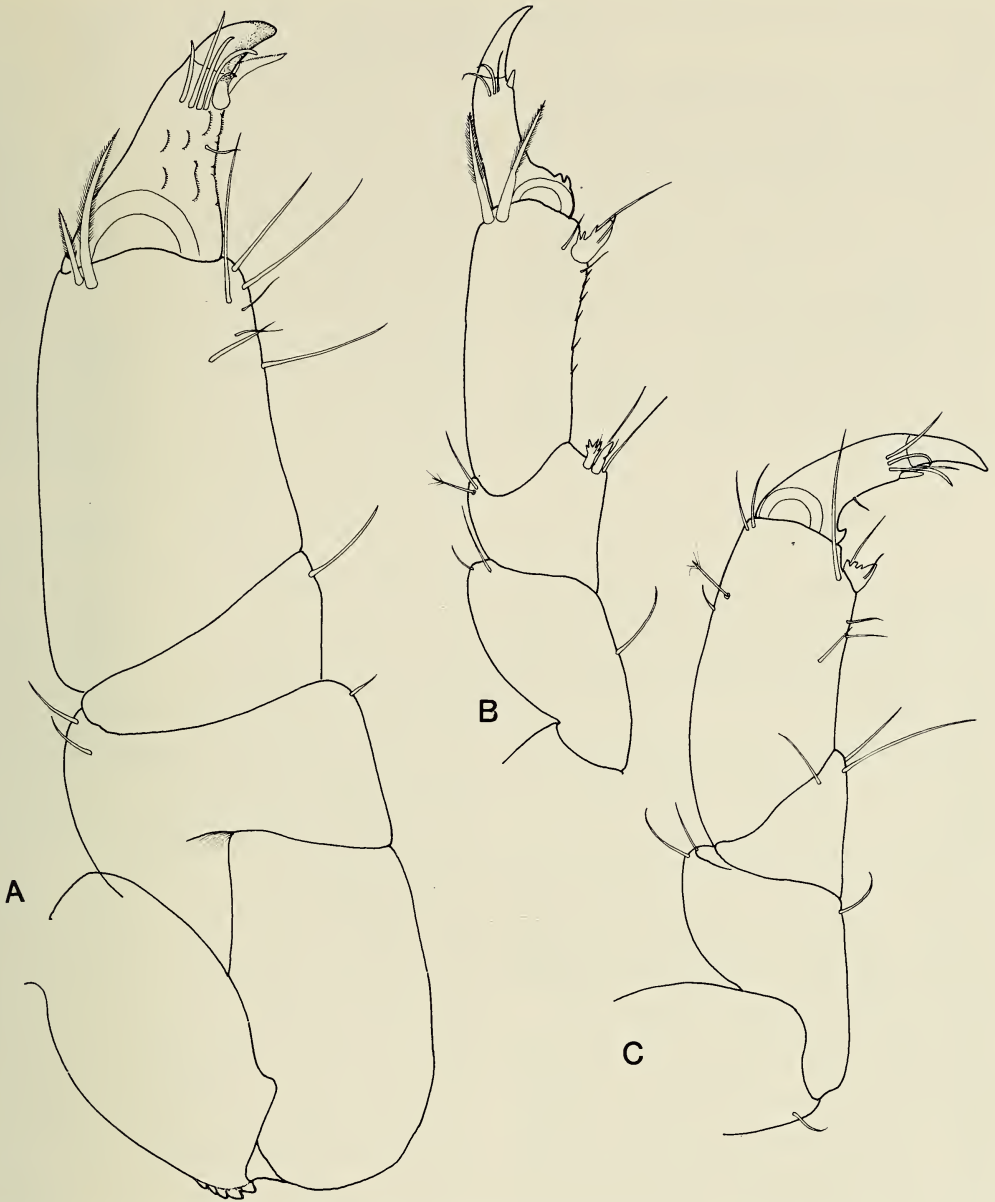


Fig. 2. *Licranthura amyle*, non-ovigerous ♀: A, Pereopod 1; B, Pereopod 7; C, Pereopod 2.

carpus short, with posterior margin longer than anterior; merus, ischium, and basis broad squat articles; basis having 4 or 5 broad serrations posterodistally. Pereopod 2, unguis about half length of remainder of dactylus, with small accessory spine at base; hook-like tooth present on posterior margin

near articulation with propodus; latter roughly rectangular, with squat dentate spine posterodistally. Pereopods 5–7, dactylus with 2 basal serrations; propodus rectangular, with strong dentate posterodistal spine, 2 anterodistal fringed spines; carpus with posterior margin longer than anterior

margin, bearing strong dentate posterodistal spine.

Pleopods essentially similar; pleopod 1 only slightly larger than following pleopods, rami both contributing to opercular function, of equal length, endopod about $\frac{2}{3}$ width of exopod. Uropodal exopod widening distally, outer (free) margin serrate, ending in outer narrowly triangular acute lobe and more broadly rounded inner lobe; endopod ovate, with serrate margin.

Etymology.—The specific name is derived from the Greek *myle*, a grinder, and refers to the lack of a molar in the mandible of this species.

Mesanthura looensis, new species

Fig. 3

Material.—HOLOTYPE, USNM 211406, non-ovig. ♀, tl 10.0 mm; sta FLK-22, Looe Key, Florida, sandy bottom in gorgonacean bed with scattered sponges and corals, 1 m, 26 Jan 1983.

PARATYPES, USNM 211407, 2 non-ovig. ♀, tl 7.0, 7.0 mm. Same data as holotype.

Description.—Female: Body proportions, $C < 1 = 2 > 3 < 4 = 5 = 6 > 7 = Pl$. Pleonite 6 fused with telson ventrally; mid-dorsally, posterior margin having tiny emargination. Telson thin, dorsally slightly concave, outline evenly elongate-oval.

Antennular flagellum of 4 articles, 2 distal articles each with 2 aesthetascs. Antennal flagellum of 5 setose articles. Mandibular palp of 3 articles, article 2 bearing fringed scales; article 3 with 8 fringed spines; lamina dentata of 4 serrations; molar thin-walled, truncate. Maxilliped lacking endite; palp of 3 articles, terminal article semicircular in outline, with 2 fringed setae and 3 simple setae on medial margin.

Pereopod 1 subchelate, unguis slightly less than half length of remainder of dactyl; propodus expanded, palm with proximal rounded scale-bearing lobe armed with 6

setae; carpus triangular, distally having rounded scale-bearing lobe carrying 5 simple setae. Pereopod 2, propodus rectangular, not expanded or subchelate, with serrate sensory spine at posterodistal angle; carpus short, triangular. Posterior pereopods, propodus somewhat curved, with posterodistal series of short setae and strong serrate sensory spine at posterodistal angle; carpus with posterior margin longer than anterior, sensory spine at posterodistal angle.

Pleopod 1, exopod operculiform, slightly longer and 3 times wider than endopod; protopod bearing 5 retinacula. Uropodal exopod ovate, with outer distal margin sinuate; endopod broadly ovate.

Color pattern: dorsum of cephalon, pereon, pleon, telson, and uropods with strong red-brown pigment; cephalon with broad patch between eyes, and extending to posterior margin; on pereonites 1–3 pigment anteriorly broad, posteriorly constricted; pereonites 4–6 covering most of dorsum, with oval middorsal unpigmented patch; pigment more constricted on pereonite 7; covering most of pleon with middorsal open patch; telson and uropodal rami with patch in central area.

Remarks.—The present species differs from the seven previously described species of *Mesanthura* mainly in its distinctive dorsal pigment pattern. The spination of the mandibular palp article 3 is the other most useful character for species separation in *Mesanthura*. The series of eight spines in *M. looensis* differs from all the other seven species (*M. fasciata* Kensley, 1982–4, *M. hopkinsi* Hooker, 1985–4, *M. paucidens* Menzies & Glynn, 1968–6, *M. reticulata* Kensley, 1982–6, *M. punctillata* Kensley, 1982–7, *M. pulchra* Barnard, 1925–10, *M. floridensis* Menzies & Kruczynski, 1983–12–13).

Etymology.—The specific name is derived from the type locality, Looe Key, Florida.

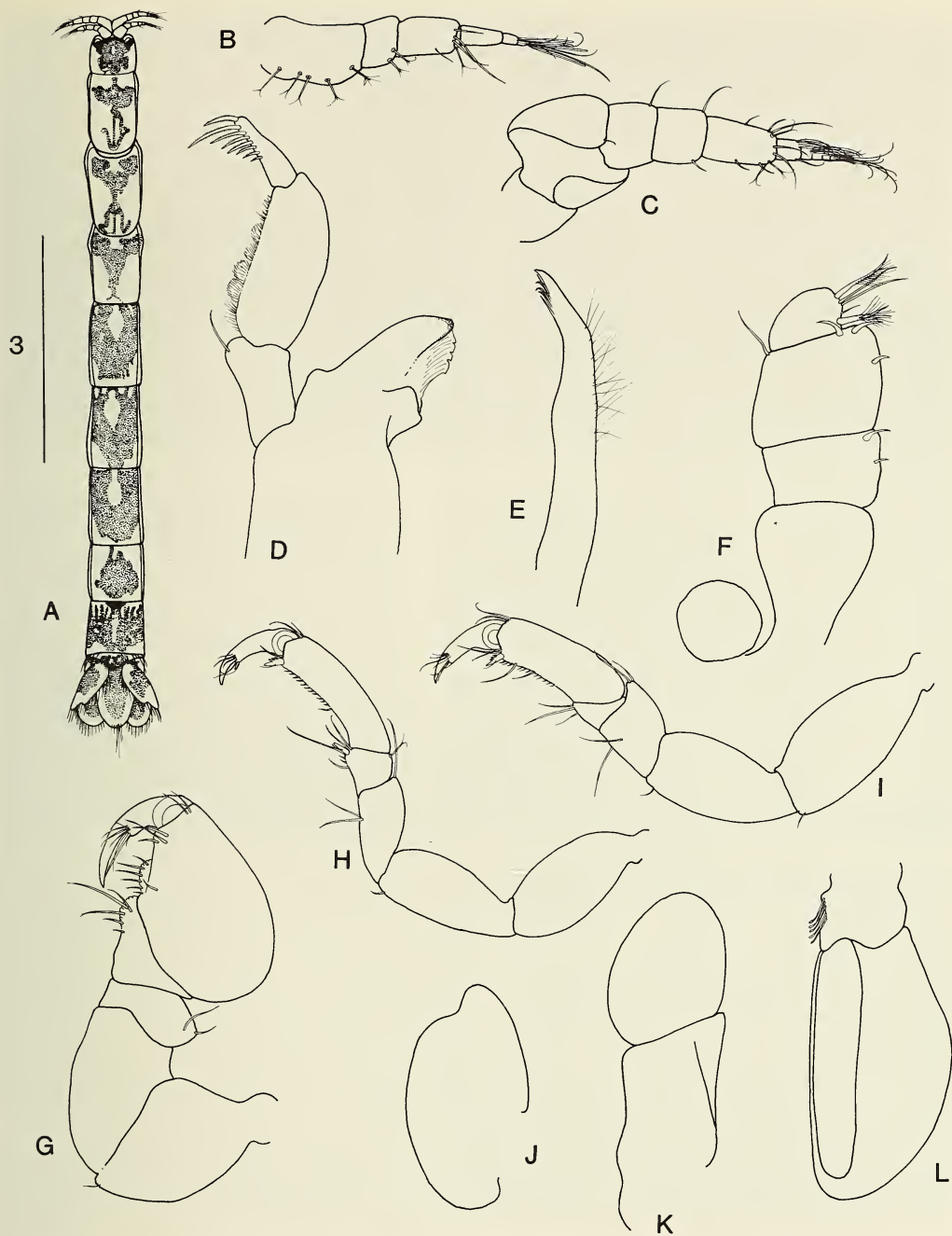


Fig. 3. *Mesanthura loeensis*, non-ovigerous ♀: A, Whole animal in dorsal view; B, Antennule; C, Antenna; D, Mandible; E, Maxilla; F, Maxilliped; G, Pereopod 1; H, Pereopod 7; I, Pereopod 2; J, Uropodal exopod; K, Uropodal endopod and basis; L, Pleopod 1.

Family Limnoriidae

Menzies and Glynn (1968), and Menzies and Kruczynski (1983) together list six species of limnoriids recorded from the Gulf of Mexico and the Caribbean. These are *Limnoria platycauda* Menzies, 1957, *L. pfefferi* Stebbing, 1904, *L. simulata* Menzies, 1957, *L. saseboensis* Menzies, 1957, *L. tripunctata* Menzies, 1951 (= *L. tuberculata* Sowinsky, 1884), and *Paralimnoria andrewsi* (Calman, 1910). Kühne (1975) records *L. tripunctata*, *L. saseboensis*, *L. pfefferi*, and *L. multipunctata* Menzies, 1957, from the Caribbean. From the Twin Cays and Man o'War Cay areas of Belize, six species of *Limnoria* have now been recorded, including all the abovementioned except *L. saseboensis*, plus two new records, viz. *L. indica* Becker and Kampf, 1959, and *L. unicornis* Menzies, 1957. Most of the material comes from decaying red mangrove (*Rhizophora mangle*) wood, with all except *P. multipunctata* co-occurring in a single station on Man o'War Cay.

A single undescribed species of *Phycolimnoria* is recorded from the Bahamas, rather surprisingly also from decaying mangrove wood.

The records of *L. simulata* are treated with caution, as female *L. indica* can easily be confused with the former species. The question of sexual dimorphism in *Limnoria* generally requires closer scrutiny, in light of such possible confusion.

The dark-green tests of folliculinid ciliate protozoans were found externally on several of the *Limnoria* species, (see Mohr and LeVeque 1948) and were especially common on the dorsal pleotelson and ventral coxae of *L. platycauda*.

Limnoria (Limnoria) indica

Becker and Kampf, 1959

Fig. 4

Limnoria indica Becker and Kampf, 1958: 3, figs. 2-4.—Kühne, 1975:546, figs. 3, 4.

Material.—USNM 211422, 56 speci-

mens, sta CBC K166, Man o'War Cay, Belize, from submerged red mangrove roots, 0.5 m, 29 Nov 1985.

Remarks.—This species was described from the east coast of the Indian Peninsula, while Kühne (1975) records the species from Hong Kong and Manila, as well as Madras, India. Becker and Kampf (1959) detail the sexual dimorphism reflected in the pleotelsonic structure; this dimorphism may well be the source of confusion in the identification of such species as *L. simulata* and *L. quadripunctata* from the Caribbean.

Distribution.—Mandapam Camp and Madras harbor, India; Hong Kong; Manila, Philippines.

Limnoria (Limnoria) multipunctata

Menzies, 1957

Fig. 5

Material.—USNM 211421, 4 ♂, 6 ovig. ♀, 3 non-ovig. ♀, 7 immature, Twin Cays, Belize, from dead red mangrove wood, coll. J. Kohlmeyer, 28 Nov 1985.

Remarks.—Kühne (1975) points out the variability found in this species, with material from Japan having the two pairs of submedian pleotelsonic tubercles as in the type material from the Kai Islands, while material from Puerto Rico and Jamaica lacks these tubercles. The present material from Belize also lacks these anterior tubercles, but does possess a strong middorsal longitudinal pleotelsonic ridge with rounded tubercles in the posterior half.

Distribution.—Puerto Rico; Jamaica; Koniya, Japan; Kai Islands (South Pacific).

Limnoria (Limnoria) pfefferi

Stebbing, 1904

Limnoria (Limnoria) pfefferi: Menzies, 1957:135, fig. 15.—Kühne, 1975: 547, fig. 7.

Material.—USNM 221621, 12 specimens, Twin Cays, Belize, under red mangroves, 24 Oct 1979.—USNM 221623, 7 specimens, sta H-6(80), Glover's Reef, Be-

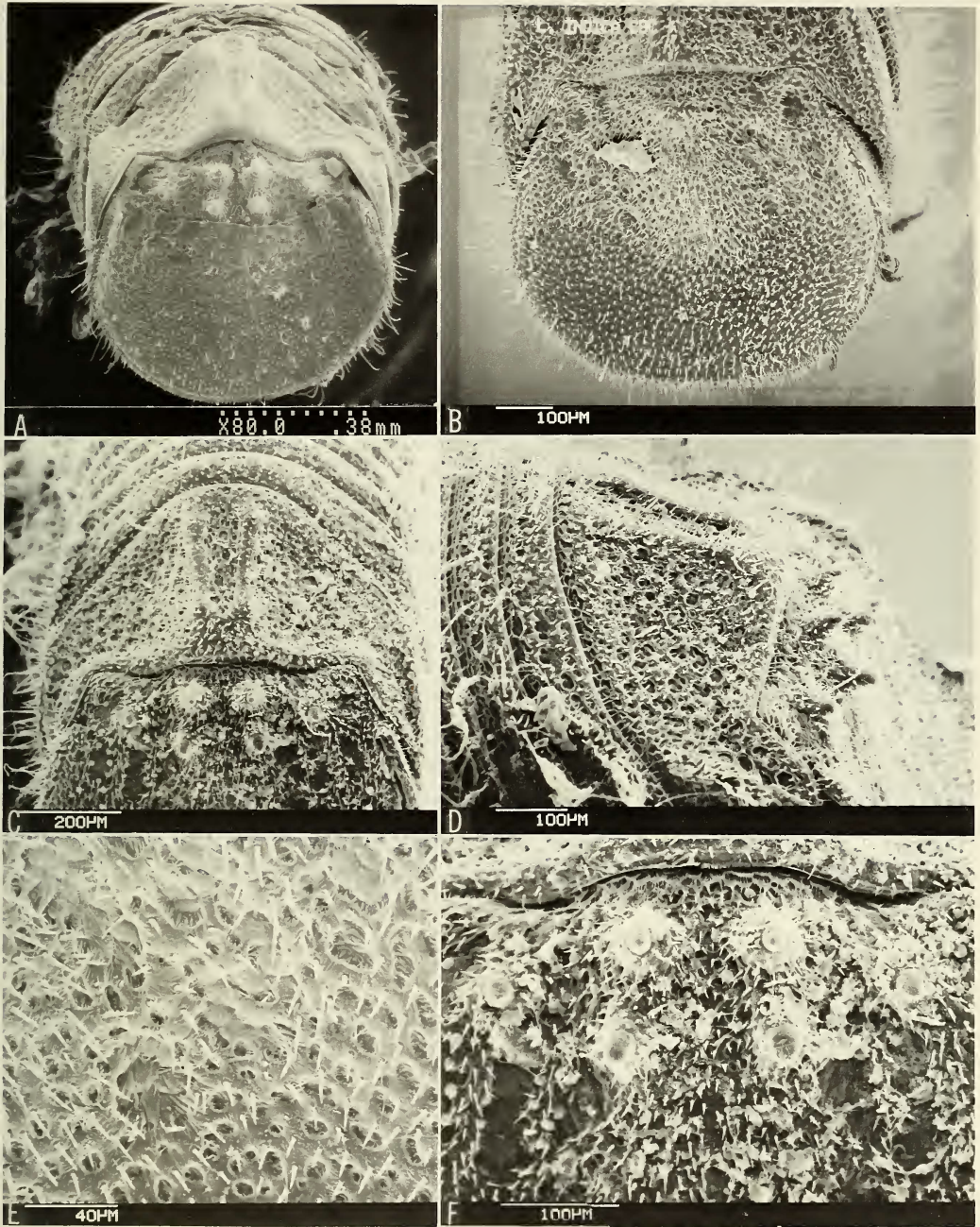


Fig. 4. *Limnoria indica*: A, Pleotelson ♂; B, Pleotelson ♀; C, Last pleonite and anterior pleotelson ♂; D, Pleotelson ♂, in lateral view; E, Pleotelsonic surface enlarged; F, Anterior pleotelson ♂, enlarged.

lize, 0-3 m, 24 Mar 1980, coll. G. Hendler.—USNM 221624, 4 specimens, sta AC-CBC-610B, Carrie Bow Cay, coarse *Halimeda* sediment, 1.5 m, 14 Jun 1981, coll.

A. Cohen.—USNM 221625, 10 specimens, sta CBC-K166, Man o'War Cay, Belize, submerged red mangrove wood and roots, 0.5 m, 29 Nov 1985.—USNM 221626, 2

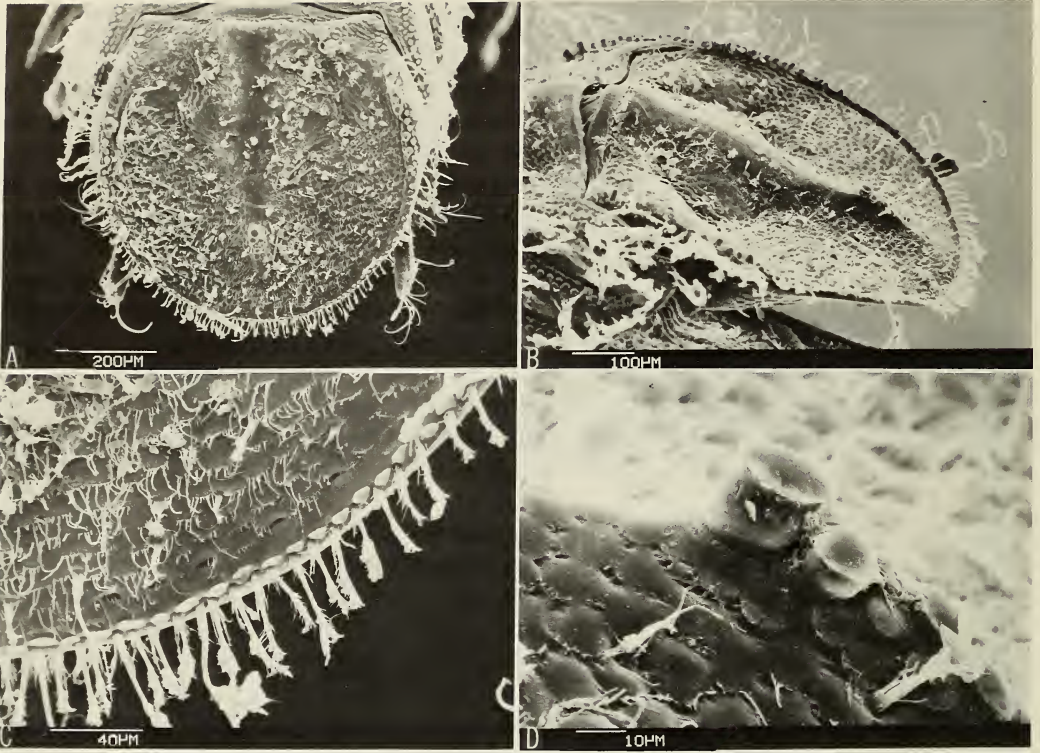


Fig. 5. *Limnoria multipunctata*: A, Pleotelson; B, Pleotelson in oblique-lateral view; C, Pleotelsonic margin; D, Middorsal tubercles of posterior pleotelson.

specimens, sta H-18(80), Twin Cays, Belize, under mangroves, 1–2 m, 28 Mar 1980, coll. G. Hendler.—USNM 221627, 5 specimens, sta CBC-K45, Twin Cays, Belize, algal mat under red mangrove roots, 0.1 m, 9 Apr 1979.

Distribution.—Indian Ocean; Florida; Puerto Rico; Panama; Philippines; New Guinea.

Limnoria (Limnoria) platycauda
Menzies, 1957

Limnoria (Limnoria) platycauda Menzies, 1957:139, fig. 17.—Ortiz, 1983:7.

Material.—USNM 221622, 23 specimens, Twin Cays, Belize, from red mangrove wood, 3 m, 28 Nov 1985, coll. J. Kohlmeyer.—USNM 221628, 38 speci-

mens, sta CBC-K166, Man o'War Cay, Belize, submerged red mangrove wood and roots, 0.5 m, 29 Nov 1985.

Distribution.—Cuba; Puerto Rico to Curaçao.

Limnoria (Limnoria) tuberculata
Sowinsky, 1884

Limnoria (Limnoria) tripunctata Menzies, 1951:86, pl. 30; 1957:137, fig. 16.

Limnoria tuberculata Sowinsky, Kussakin, 1979:322, figs. 187–190.

Material.—USNM 221630, 4 specimens, sta CBC-K166, Man o'War Cay, Belize, submerged red mangrove wood and roots, 0.5 m, 29 Nov 1985.

Distribution.—Yellow Sea; Hong Kong; Rhode Island to Venezuela; Gulf of Mexico;

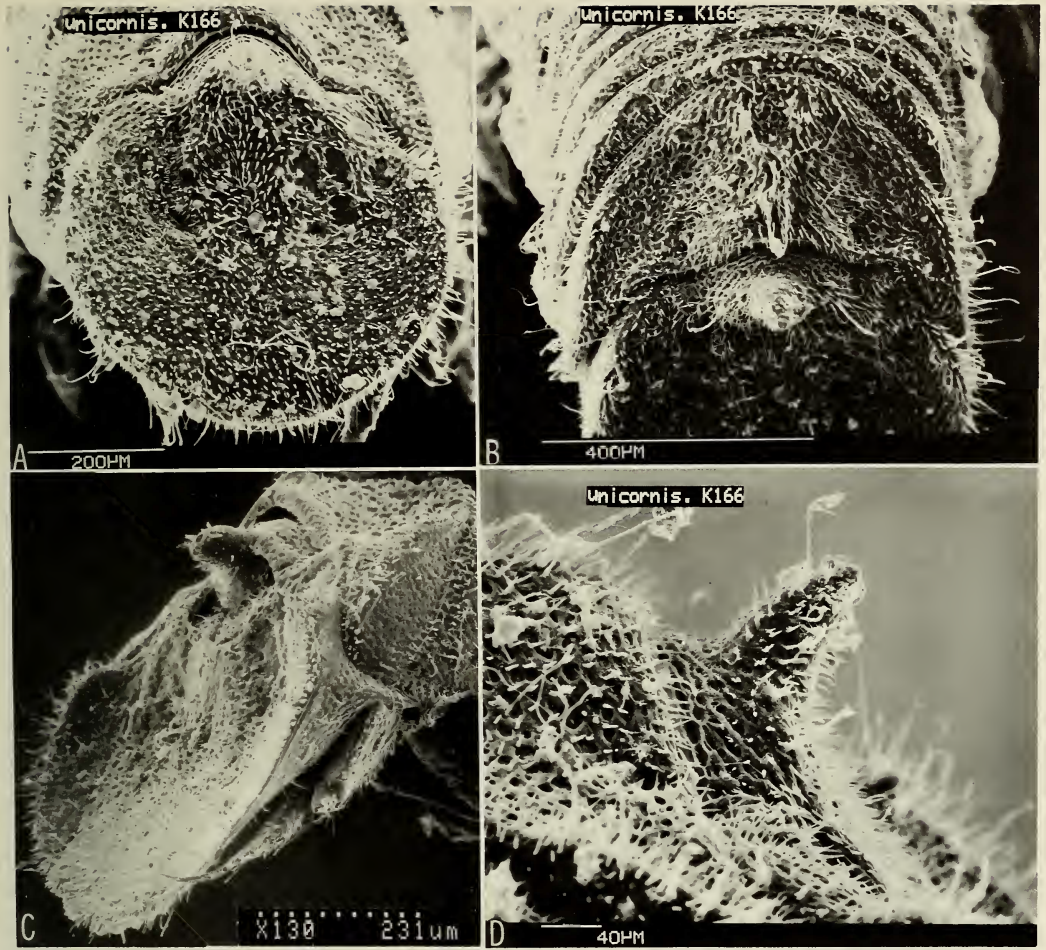


Fig. 6. *Limnoria unicornis*: A, Pleotelson; B, Last pleonite and anterior pleotelson; C, Pleotelson in oblique-lateral view; D, Pleotelsonic tooth enlarged.

Caribbean; Uruguay; California; Hawaii; Australia; Mediterranean; Black Sea; India; Ghana.

Limnoria unicornis Menzies, 1957

Fig. 6

Limnoria unicornis Menzies, 1957:173, fig. 32.

Material.—USNM 221631, 6 ♂, 8 ovig. ♀, 3 non-ovig. ♀, Pigeon Creek, San Salvador, Bahamas, 22 May 1986, coll. J. Clark.—USNM 211423, 2 ♂, sta CBC-K166, Man

o'War Cay, Belize, submerged red mangrove wood and roots, 0.5 m, 29 Nov 1985.—USNM 211424, 2 ♂, 1 non-ovig. ♀, Twin Cays, Belize, from green algal turf under *Rhizophora mangle*, 0.5 m.—USNM 211425, 9 ♂, 3 ovig. ♀, 6 non-ovig. ♀, 7 juvs., Ngeruktabel Is., Palau, from anchialine cenote, 9 Feb 1985, coll. T. Iliffe and D. Williams.—USNM 102745, 1 ♂, 1 ♀, 1 juv., Baie de Maroe, Huahine Is., Society Islands, 1 m, 30 Apr 1957, coll. T. Bowman.

Remarks.—This species has been mentioned once in the literature, i.e., in the orig-

inal description. For this reason, all the Smithsonian Institution (USNM) holdings, both from the Pacific and the Caribbean, are included here.

Distribution.—Caroline Islands; Society Islands; Palau; Bahamas; Belize.

Phycolimnoria clarkae, new species

Figs. 7–9

Material.—HOLOTYPE, USNM 211426, ♂ 4.3 mm, PARATYPES, USNM 211427, 44 ♂, 18 ovig. ♀, 3.3–4.4 mm, 10 non-ovig. ♀, 14 juvs., Pigeon Creek, San Salvador, Bahamas, from dead red mangrove wood, coll. J. Clark, 22 May 1986.

Description.—Dorsal integument, especially of pleotelson, bearing very fine, imbricate, minutely setulose ridges, giving appearance of fine, regular foveolation. Pleonite 5 with broad raised middorsal region, having irregular bumps. Pleotelson wider than long, with two rounded submedian ridges basally, becoming obsolete posteriorly.

Antennular peduncle of 3 articles, basal article longest and widest; flagellum consisting of basal article, wider than long, bearing 4 aesthetascs, and tiny terminal article bearing single aesthetasc and several setae. Antennal flagellum of 5 setose articles, basal article equal in length to 4 distal articles. Mandibular palp of 3 articles, two basal articles subequal in length; article 2 bearing 3 distal fringed spines; terminal article two-thirds length of article 2, bearing 6 distal fringed spines; spine row of left mandible of 2 lacinate spines, flanked by 2 short rounded lobes; spine row of right mandible of about 9 lacinate spines increasing in length proximally, plus bilobed distal process; incisor consisting of roughly triangular, strongly sclerotized, unornamented cusp. Maxilla 1 and 2 as figured. Maxillipedal endite with single coupling hook, 8 spines on distal margin, all save one bearing fine setules; palpal article 2 longest and widest; epipod about 3½ times longer than basal width, distally narrowly rounded,

reaching to base of palp. Pereopod 1, accessory spine at base of dactylar unguis short, bidentate; propodus with 2 fringed posterodistal spines; propodus, carpus, and merus each having row of 4 or 5 rounded tubercles on posterior surface. Pereopod 2 with 5 distal articles each having few tubercles on or near posterior surface; accessory spine at base of dactylar unguis short, bidentate; carpus with stout dentate spine at posterodistal angle; merus with single stout dentate spine at anterodistal corner. Pereopod 7, accessory spine of dactyl faintly bidentate; carpus with several fringed spines of varying lengths on distal margin; merus with 4 fringed spines on anterodistal margin. Paired penes on ventrum of pereonite 7. Pleopod 2, copulatory stylet sabre-shaped, articulating slightly proximal to midlength of median margin of endopod, just reaching beyond ramus. Uropodal endopod elongate-ovate, about twice longer than wide; endopod less than half length of exopod, triangular, tipped with short squat non-curved spine (claw); basis with row of fringed setae along outer margin.

Remarks.—This is the first record of the genus *Phycolimnoria* from the Caribbean, and is unusual in that the material was found, not boring into an alga as is usually the case, but in decaying red mangrove wood.

The absence of a “rasp” and “file” structure on the mandibles, along with the very unequal size of the uropodal rami, place this species in the genus *Phycolimnoria* Menzies.

Two features easily separate this species from the other 11 species of *Phycolimnoria* already described. None of these species possess a uropodal exopod with a short straight terminal claw. Only *P. zinovae* Kusakin, 1963, from the Sea of Japan, has a uropodal exopod in which the terminal claw is almost straight. This latter species, however, has a distinctive Y-shaped ridge on pleonite 5. *Phycolimnoria clarkae*, with its raised and rounded central area of pleonite 5, and the two longitudinal submedian rounded ridges of the pleotelson with no

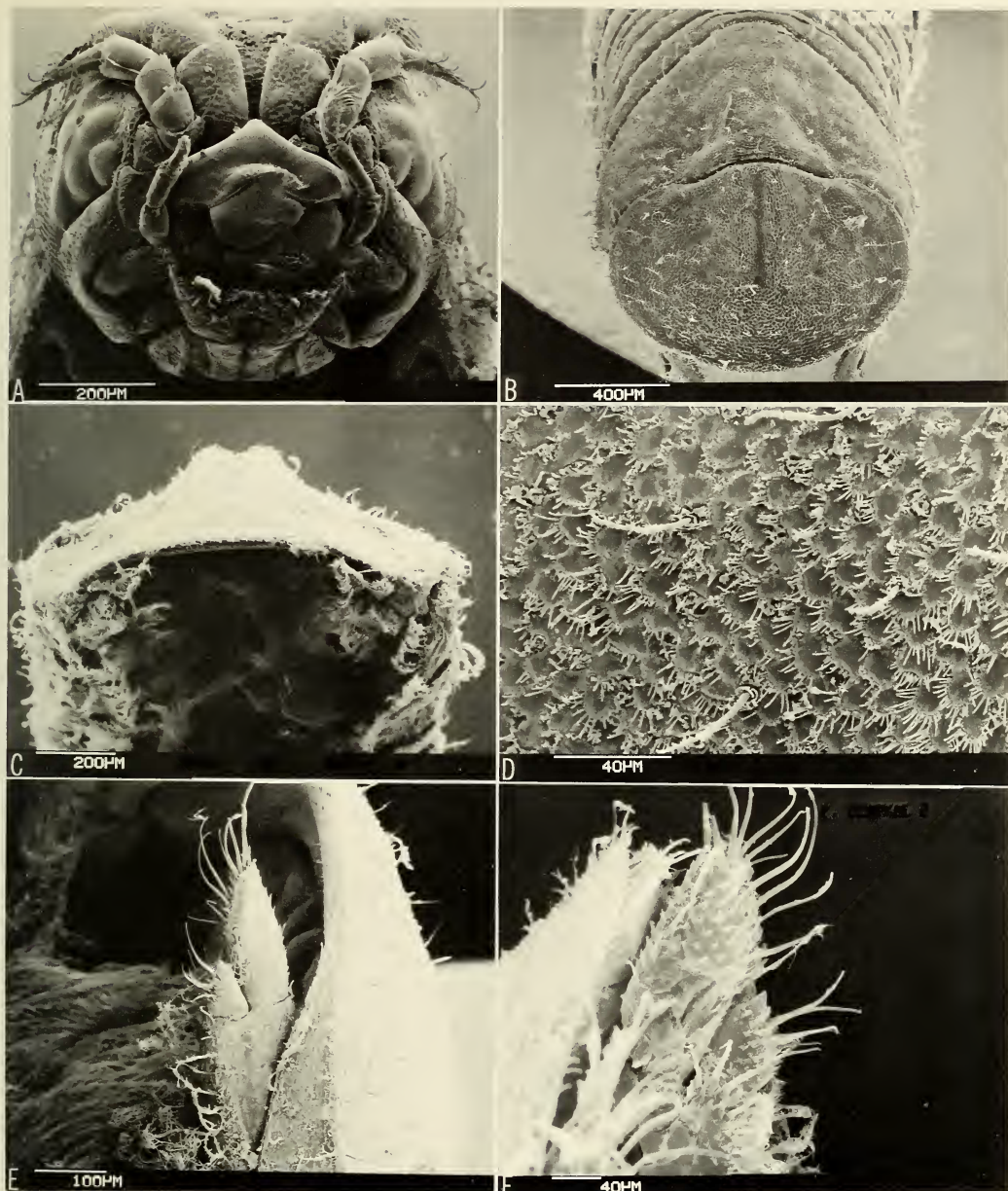


Fig. 7. *Phycolimnoria clarkae*: A, Cephalon in ventral view; B, Pleotelson; C, Pleotelson seen from posterior margin; D, Pleotelsonic integumental surface enlarged; E, F, Uropod.

other ornamentation would also seem to be unique in the genus.

Etymology.—The species is named for Janice Clark of the Department of Invertebrate Zoology, Smithsonian Institution, who collected the type material.

Family Cirolanidae

Cirolana albidoida, new species

Figs. 10–12

Material.—HOLOTYPE, USNM 211419, ♂ tl 7.8 mm; sta GB-7, off Lucaya, Grand



Fig. 8. *Phycolimmoria clarkae*: A, Left mandible; B, Incisor and spine row of right mandible; C, Antennule; D, Antenna; E, Maxilla 1; F, Maxilla 2; G, Maxilliped.

Bahama, 180–220 m, from trap baited with fish, set for 8 days, 24 May 1981, coll. D. Camp.

PARATYPES, USNM 211420, 55 spec-

imens, 4.6–9.0 mm; same data as holotype. All specimens lack internal organs and musculature, suggesting that they may have been retained dead in the fish trap for some days.

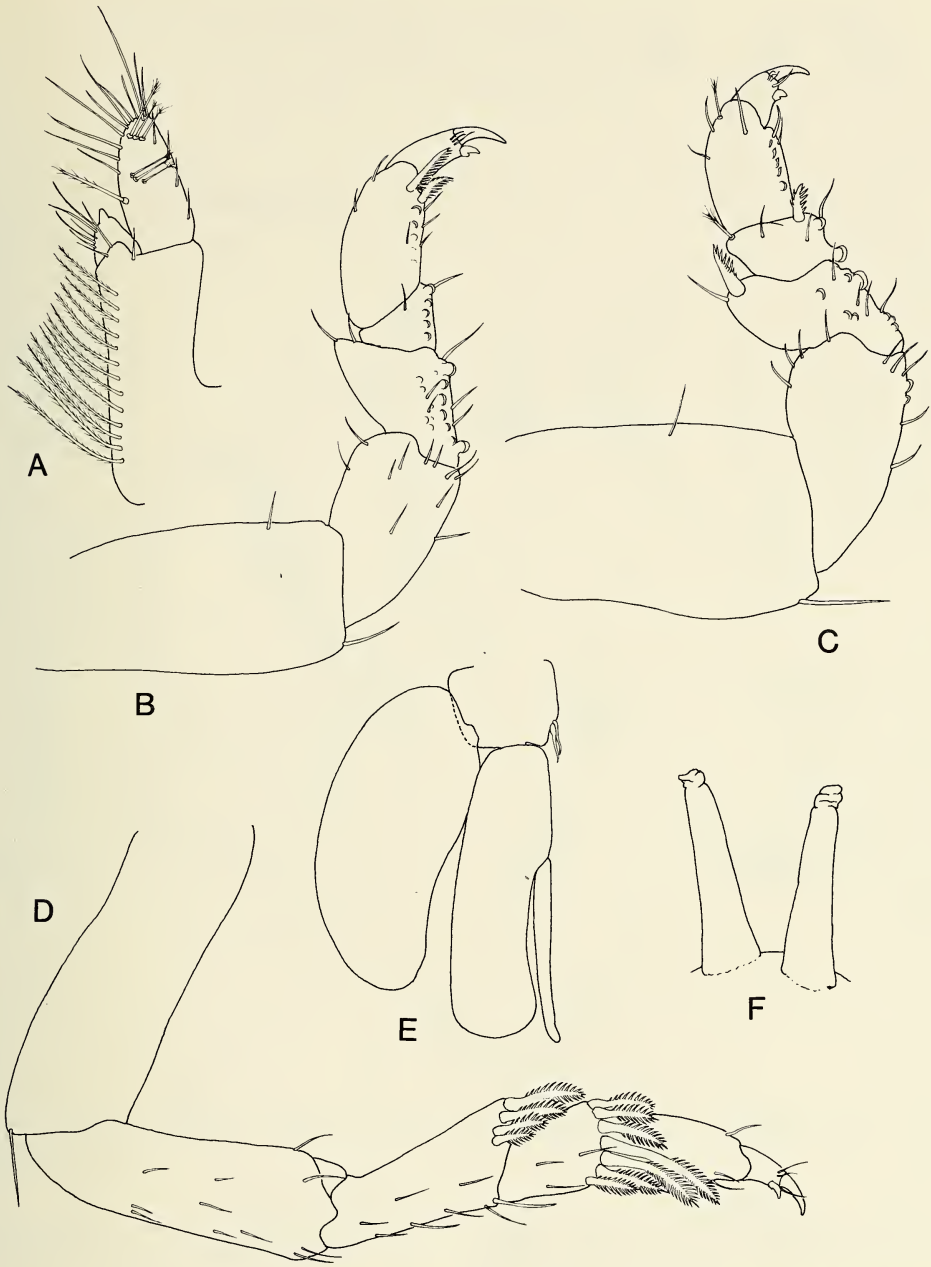


Fig. 9. *Phycolimnoria clarkae*: A, Uropod; B, Pereopod 1; C, Pereopod 2; D, Pereopod 7; E, Pleopod 2 ♂; F, Penes.

Description.—Male: Body about $3\frac{1}{2}$ times longer than wide, widest at pereonite 1. Integument sparsely pitted. Cephalon width about $\frac{1}{3}$ longer than medial length, with small rostral point between antennal bases.

Frontal lamina an equilateral pentagon. Pereonite 1 about $2\frac{1}{2}$ times length of pereonite 2; pereonites 3–6 subequal in mid-dorsal length, pereonite 7 slightly shorter. Coxae of pereonites 2 and 3 rounded, of

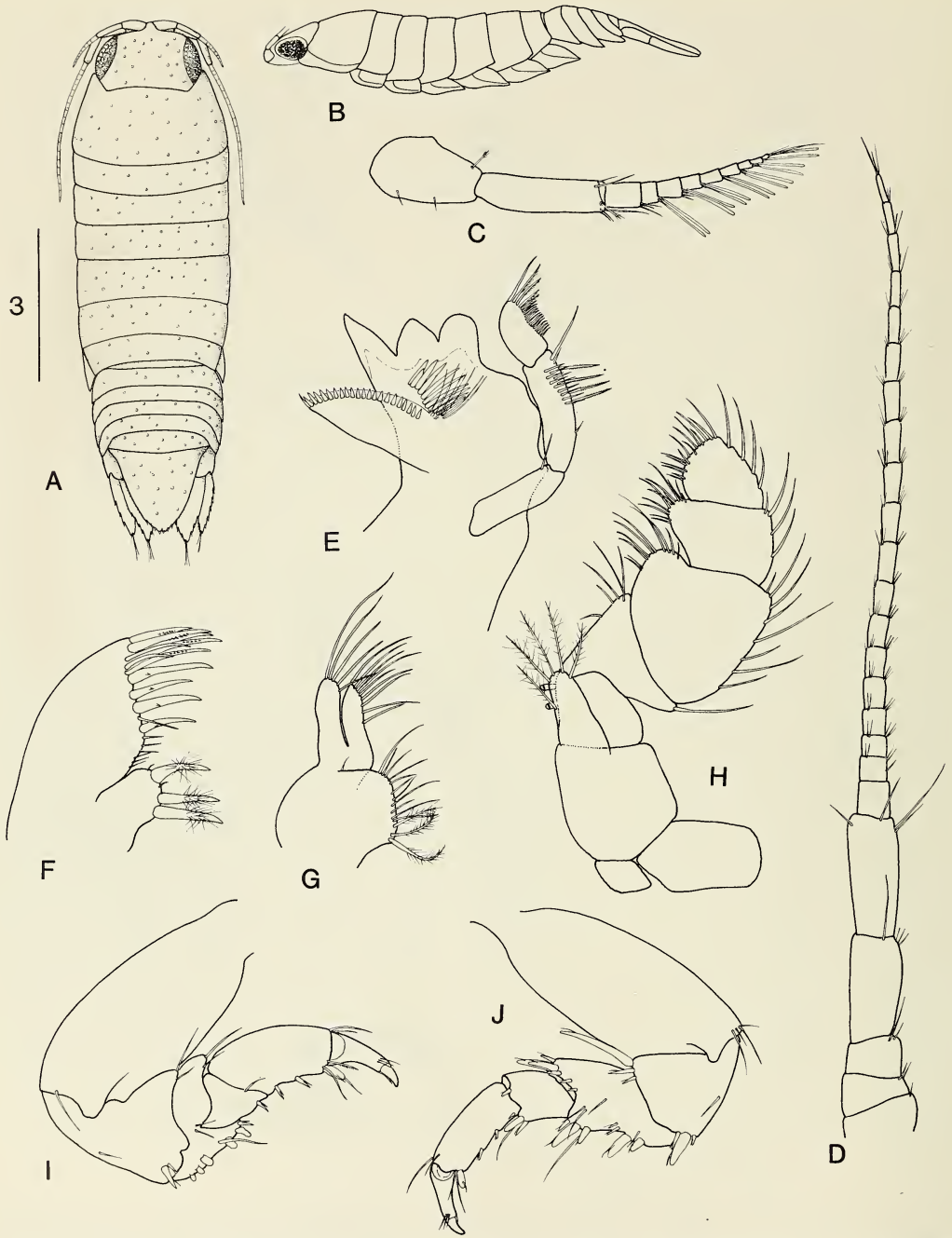


Fig. 10. *Cirolana albidoida*: A, Holotype in dorsal view; B, Whole animal in lateral view; C, Antennule; D, Antenna; E, Right mandible; F, Maxilla 1; G, Maxilla 2; H, Maxilliped; I, Pereopod 1; J, Pereopod 2.

pereonite 4 just less than right-angled, of 5–7 somewhat produced, acute, with oblique upcurving furrow. Pleonite 1 laterally overlapped by pereonite 7; epimera of pleonites

1–2 acutely produced, of pleonite 4 broader, subacute; pleonite 5 lacking free lateral margin.

Antennule reaching to posterior margin

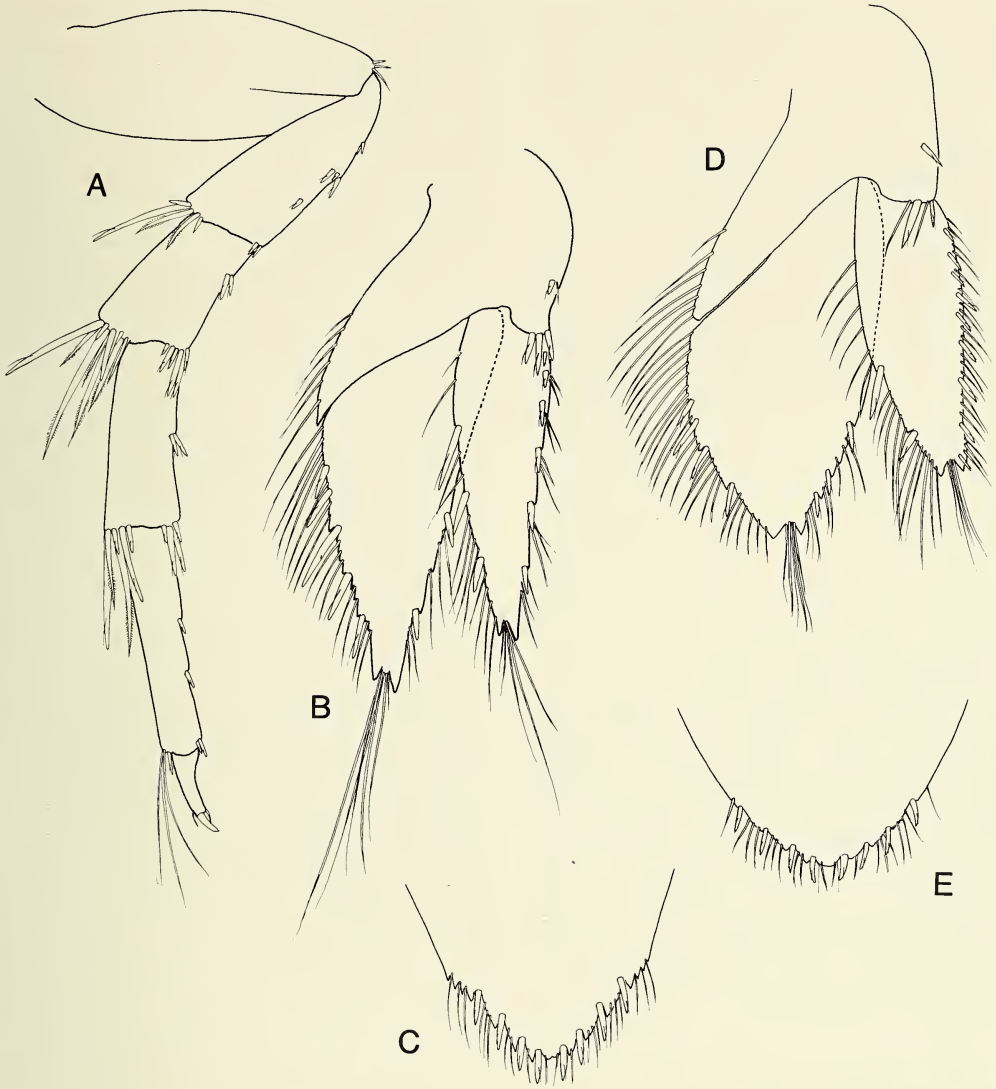


Fig. 11. *Cirolana albidoidea*: A, Pereopod 7; B, Uropod; C, Pleotelsonic apex. *Cirolana albida*: D, Uropod; E, Pleotelsonic apex.

of cephalon; two basal peduncular articles fused, line of fusion faintly visible, article $3\frac{1}{4}$ longer, but narrower than basal article; flagellum of 10 articles, aesthetascs present on distal 8 articles. Antennal peduncle with three basal articles short, articles 4 and 5 more elongate, 4 slightly shorter than 5; flagellum of 19 articles. Mandibular palp of 3 articles, article 2 with 5 elongate and about 11 shorter distal spines, article 3 with 18 marginal spines becoming distally progres-

sively longer; incisor of 3 cusps; molar bearing 22 teeth. Maxilla 1, inner ramus with 3 stout setae; outer ramus with about 11 spines on mediolateral margin. Maxilla 2, inner ramus with 3 fringed proximal setae and about 11 simple distal setae; inner lobe of outer ramus with 9 distal setae, outer lobe with 5 setae. Maxillipedal endite reaching to end of basal palp article, with 2 coupling hooks and 5 fringed setae; palp article 3 longest and widest; articles 2-5 with dense setae on

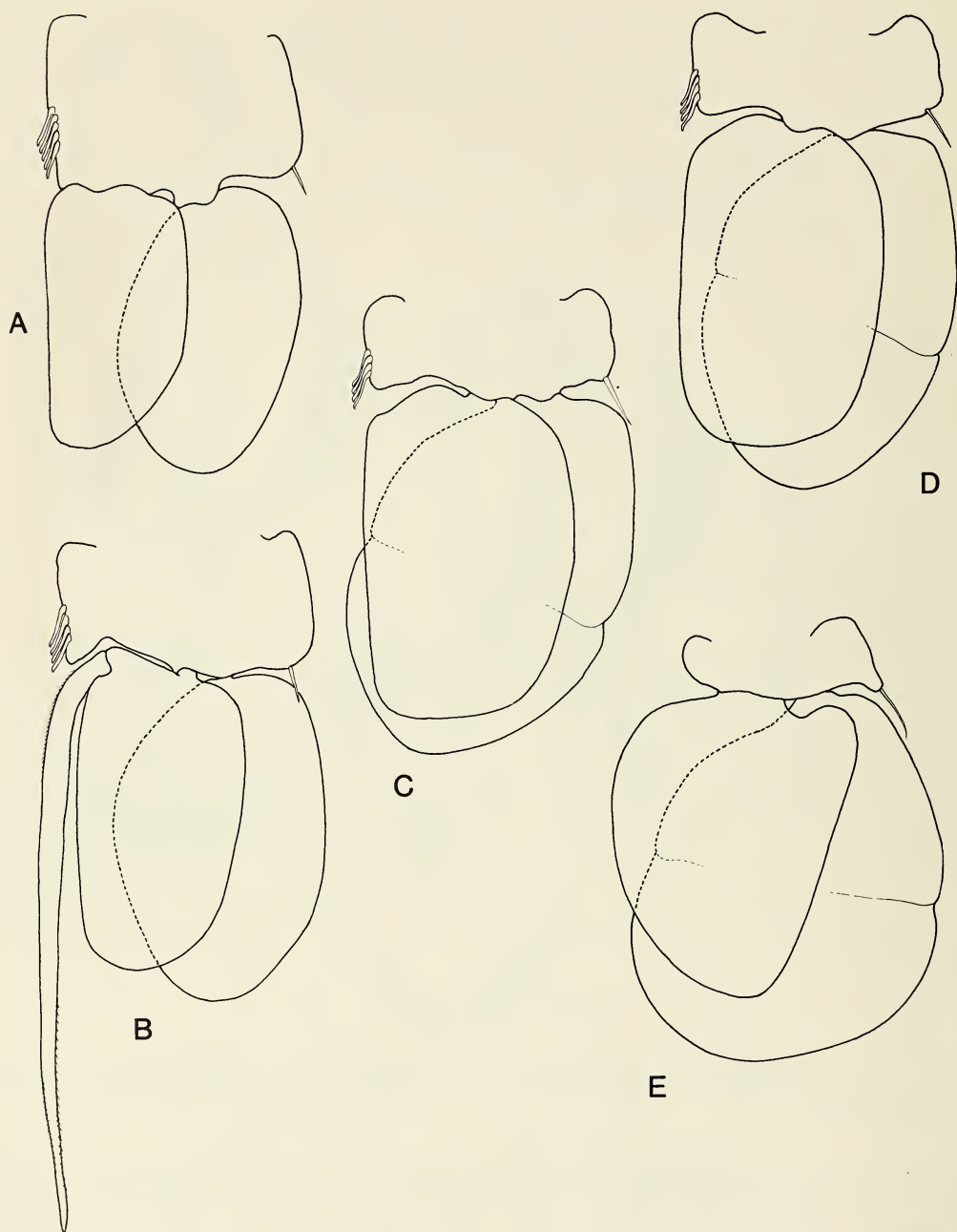


Fig. 12. *Cirolana albidoida* ♂: A, Pleopod 1; B, Pleopod 2; C, Pleopod 3; D, Pleopod 4; E, Pleopod 5.

mediodistal margins, sparser setae on outer margins.

Pereopod 1 robust, dactyl slightly more than half anterior length of propodus; prop-

odus with stout rounded posterodistal spine and 2 smaller sensory spines on posterior margin; carpus triangular, with single sensory spine; merus with 5 stubby rounded

spines on posterior margin; ischium with 2 acute posterodistal spines. Pereopods 2 and 3 similar, dactylus about $\frac{2}{3}$ length of propodus; latter with rounded posterodistal spine and 2 smaller sensory spines on posterior margin; carpus with 2 posterodistal spines; merus with 5 large sensory spines on posterior margin, several anterodistal spines of varying length; ischium with 1 elongate and 2 smaller posterodistal spines, 1 elongate and 2 small anterodistal spines. Pereopods 4–7 similar, becoming progressively more elongate; dactylus about $\frac{1}{3}$ length of propodus; latter elongate-cylindrical, with 3 small spines on posterior margin; carpus about $\frac{2}{3}$ length of propodus, with 2 spines at midlength of posterior margin, clump of 4 posterodistal spines, clump of 6 anterodistal spine of which 2 fringed; merus about $\frac{2}{3}$ length of carpus, with 2 spines in proximal half of posterior margin, clump of 6 posterodistal spines, clump of 9 or 10 anterodistal spines, several of which fringed; ischium with several small spines on posterior margin and clump of 5 anterodistal spines, 2 of which fringed. Pleopods, all rami fringed with plumose setae; pleopod 1 peduncle roughly rectangular, with 5 coupling hooks on median margin, endopod slightly shorter and narrower than exopod, latter elongate-ovate; pleopod 2, peduncle roughly rectangular, with 4 coupling hooks on medial margin, copulatory stylet articulating at base of endopod, slender, tapering reaching by half its length beyond rami; pleopod 3, peduncle with 4 coupling hooks, exopod longer and broader than endopod, with indistinct transverse articulation at midlength; pleopod 4 peduncle with 4 coupling hooks, exopod broadly ovate, with distinct articulation at midlength; pleopod 5 exopod becoming almost circular in outline, with distinct articulation at midlength. Uropodal peduncle bearing 3 spines at laterodistal angle, mesiodistal angle produced into acute triangular setose lobe; exopod subequal in length to, but half basal width of, endopod, with 5 spines on lateral margin, 3 on inner

margin, apically bifid; endopod with 2 or 3 spines on lateral margin, 5 on inner margin, apically bifid; apices of both rami bearing elongate simple setae.

Remarks.—Of the Caribbean species of *Cirolana*, the present species closely resembles *C. albida* Richardson, 1901, known only from the type locality, Sugarloaf Key, Florida. This resemblance is seen in the overall size, the shape of the frontal lamina, the integumental pitting, and the overall similarity of the appendages. The major differences are seen in the proportions of the uropods and telson. In *C. albidoidea*, the uropodal rami are more slender, the endopod especially being almost straight-sided; the posterior telson is also straight-sided, apically somewhat narrowed, with four marginal serrations anterior to the apical spination. *Cirolana albida* has the outer margin of the uropodal endopod distinctly convex, with both endopod and exopod proportionally broader; the telson is posteriorly more rounded than in the new species, and lacks the proximal serrations. The copulatory stylet of pleopod 2 in the male provides another differences, extending by almost half its length beyond the rami in the new species, and just barely beyond the rami in *C. albida*. The number of antennal flagellar articles in *C. albida* (20–32) would seem to be higher than in *C. albidoidea* (18–20).

Etymology.—The specific epithet, meaning “like *albida*,” refers to the high degree of similarity of the two species.

Cirolana minuta Hansen, 1890

Fig. 13, 14

Cirolana minuta Hansen, 1890:347, pl. 3 fig. 5, pl. 4 fig. 1.—Richardson, 1901:512; 1905:83, 92, fig. 74.—Menzies and Glynn, 1968:11.—Schultz, 1969:180, fig. 279.—Bruce, 1981:961.

?*Cirolana minuta*: Stebbing, 1900:634 [Loyalty Islands].

Material.—SYNTYPES, Copenhagen

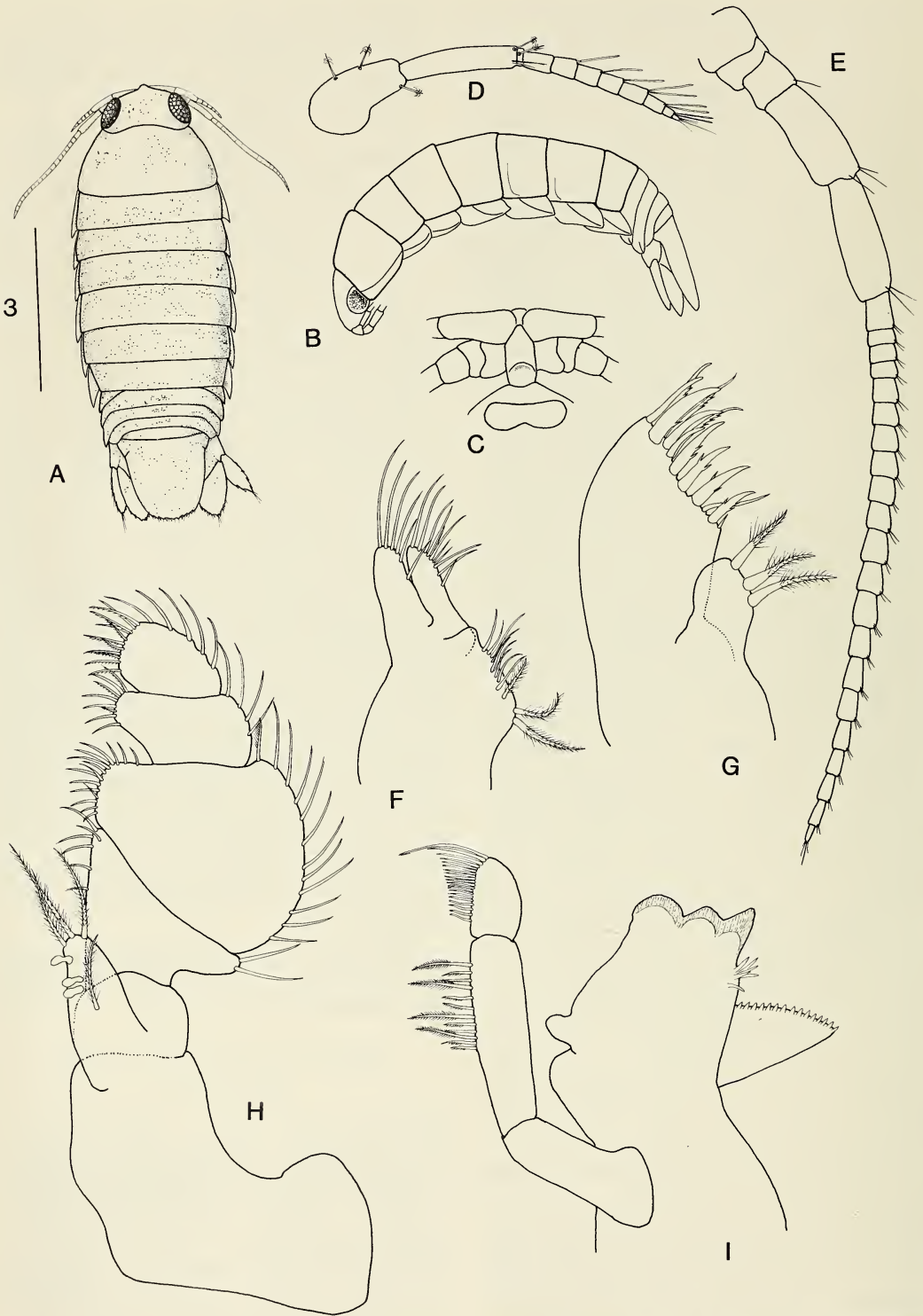


Fig. 13. *Cirolana minuta*: A, Adult ♀ in dorsal view; B, Adult in lateral view; C, Antennal, antennular bases and frontal lamina; D, Antennule; E, Antenna; F, Maxilla 2; G, Maxilla 1; H, Maxilliped; I, Mandible.

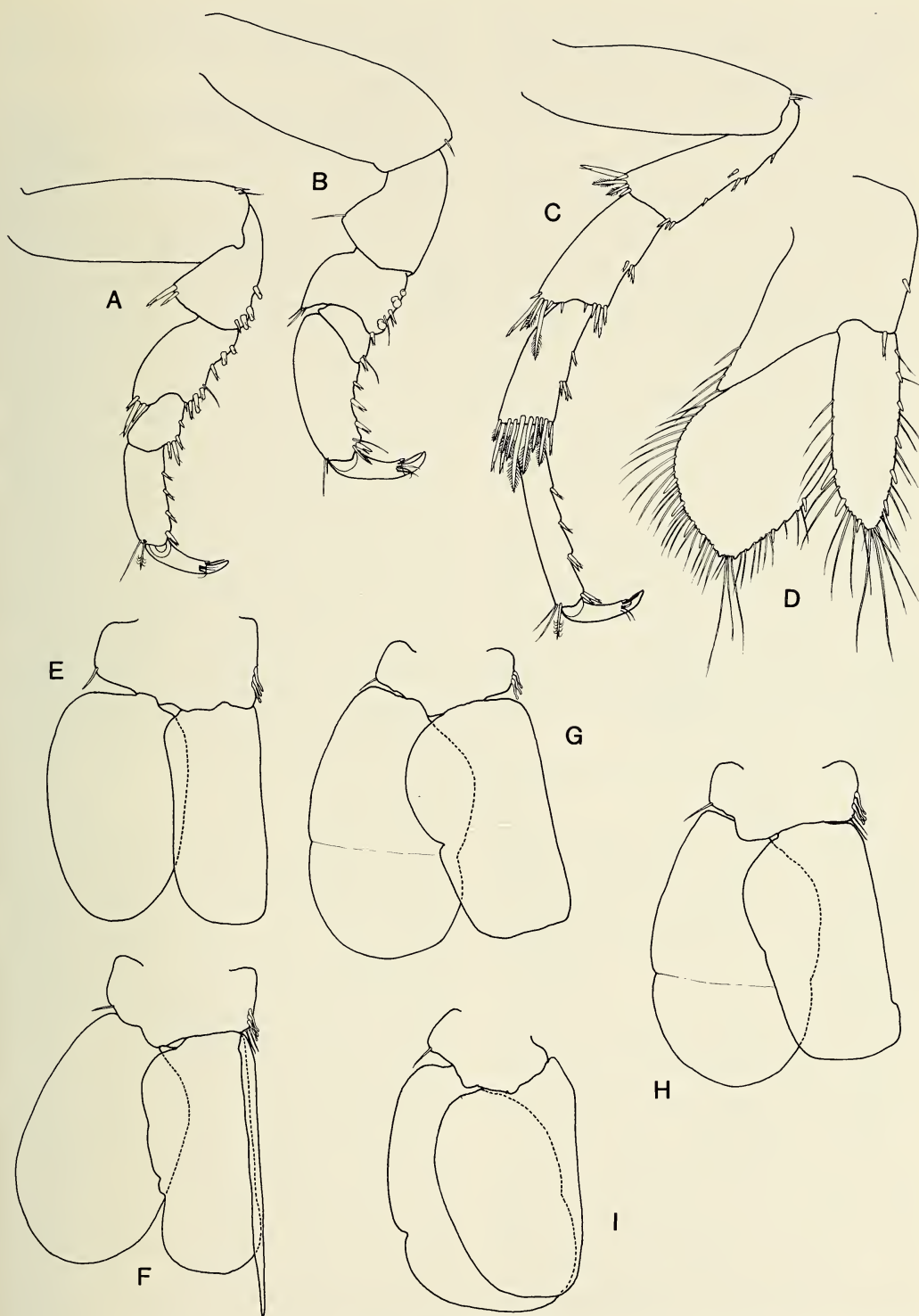


Fig. 14. *Cirolana minuta*: A, Pereopod 1; B, Pereopod 2; C, Pereopod 7; D, Uropod; E, Pleopod 1; F, Pleopod 2; G, Pleopod 3; H, Pleopod 4; I, Pleopod 5.

Museum, 3 specimens, 5.0, 4.6, 4.1 mm, probably St. Thomas, U.S. Virgin Islands.

USNM 221618, 4 ♂, 7.0-8.9 mm, 1 ♀, 4.6 mm, sta GB-7, off Lucaya, Grand Bahama, 180-220 m, coll. D. Camp.

Remarks.—Hansen (1890:348) stated under the heading 'Occurrence' for the description of *C. minuta*: 3 specimens, without locality, found in a vial with 1 specimen of *C. parva*, which leads to the probable conclusion that they originate from the West Indies, and most likely from St. Thomas. (Translation from J. Just, in litt.). These three syntypes were compared with the six USNM specimens from the Bahamas; no differences other than size could be found, leading us to suspect that the syntypes are immature specimens.

Stebbing's record (1900) from the Loyalty Islands and his suggestion that *C. minuta* is synonymous with *C. latistylis* Dana, 1853, from the Indo-Pacific, are not dealt with here. Even though Nordenstam (1946) also suggested this synonymy, it seems unlikely that the Indo-Pacific species is the same as the present Caribbean species.

Cirolana crenulitelson, new species

Figs. 15, 16

Material.—HOLOTYPE, USNM 221619, ovig. ♀, tl 6.8 mm, sta H41-80, PARATYPES, USNM 221620, ♀, 7.0 mm, ovig. ♀, 6.2 mm, ♂, 7.0 mm, sta H41-80, Carrie Bow Cay, Belize, 36 m, 5 Apr 1980, coll. G. Henderl.

Description.—Male: Body $2\frac{1}{2}$ times longer than wide, widest at pereonite 5. Cephalon with well developed eyes; frontal lamina pentagonal, longer than wide. Pereonite $2\frac{2}{3}$ length of pereonite 1; pereonites 2-6 subequal in middorsal length, pereonite 7 slightly shorter; coxa of pereonites 2 and 3 posteriorly rounded, of pereonites 4-7 acute, becoming more elongate posteriorly. Pleonite 1 overlapped laterally by pereonite 7; epimera of pleonites 1-3 elongate-acute, of pleonite 4 rounded; pleonite 5 lacking free lateral margin. Telson basally wider than

long, tapering gently to posterior truncate margin; latter with small but distinct crenulations.

Antennule barely reaching to end of antennal peduncle; articles 1 and 2 fused, together almost $1\frac{1}{2}$ times length of article 3; flagellum of 10 articles, aesthetascs present on 8 distal articles. Antennal peduncle with 3 short proximal articles, 2 distal articles more elongate, subequal; flagellum of 15 articles. Mandibular palp of 3 articles, article 2 with about 18 spines on outer face; article 3 with row of 22 serrate spines, becoming distally more elongate; incisor of 3 cusps; molar bearing 10 teeth. Maxilla 1, inner ramus with 3 stout setae; outer ramus with about 11 spines, some with few lateral teeth, on mediiodistal margin. Maxilla 2, inner ramus broadly truncate, bearing about 15 setae, 2 proximal setae fringed; inner lobe of outer ramus with 9 distal setae, outer lobe with 4 elongate setae. Maxillipedal endite reaching to distal margin of palp article 1, bearing single coupling hook and 5 fringed setae; palp article 3 longest and broadest, articles 3-5 with setae on inner margins, outer margins with setae more widely spaced.

Pereopod 1 robust, dactyl about half length of anterior margin of propodus; latter with strong rounded posterodistal spines and 2 smaller acute spines on posterior margin; carpus short with 2 small spines on posterior margin; merus with 5 stout rounded spines and 5 small acute spines on posterior margin; ischium with few scattered small spines posterodistally. Pereopods 2 and 3 similar, with propodus bearing strong posterodistal spine and 2 smaller spines on posterior margin; carpus more elongate than in pereopod 1, roughly rectangular, with group of 3 posterodistal spines; merus with group of 6 anterodistal spines, posterior margin bearing about 9 spines of varying lengths; ischium roughly triangular, with two anterodistal spines and 4 posterodistal spines. Pereopods 4-7 becoming more elongate, similar; dactyl slightly less than half length

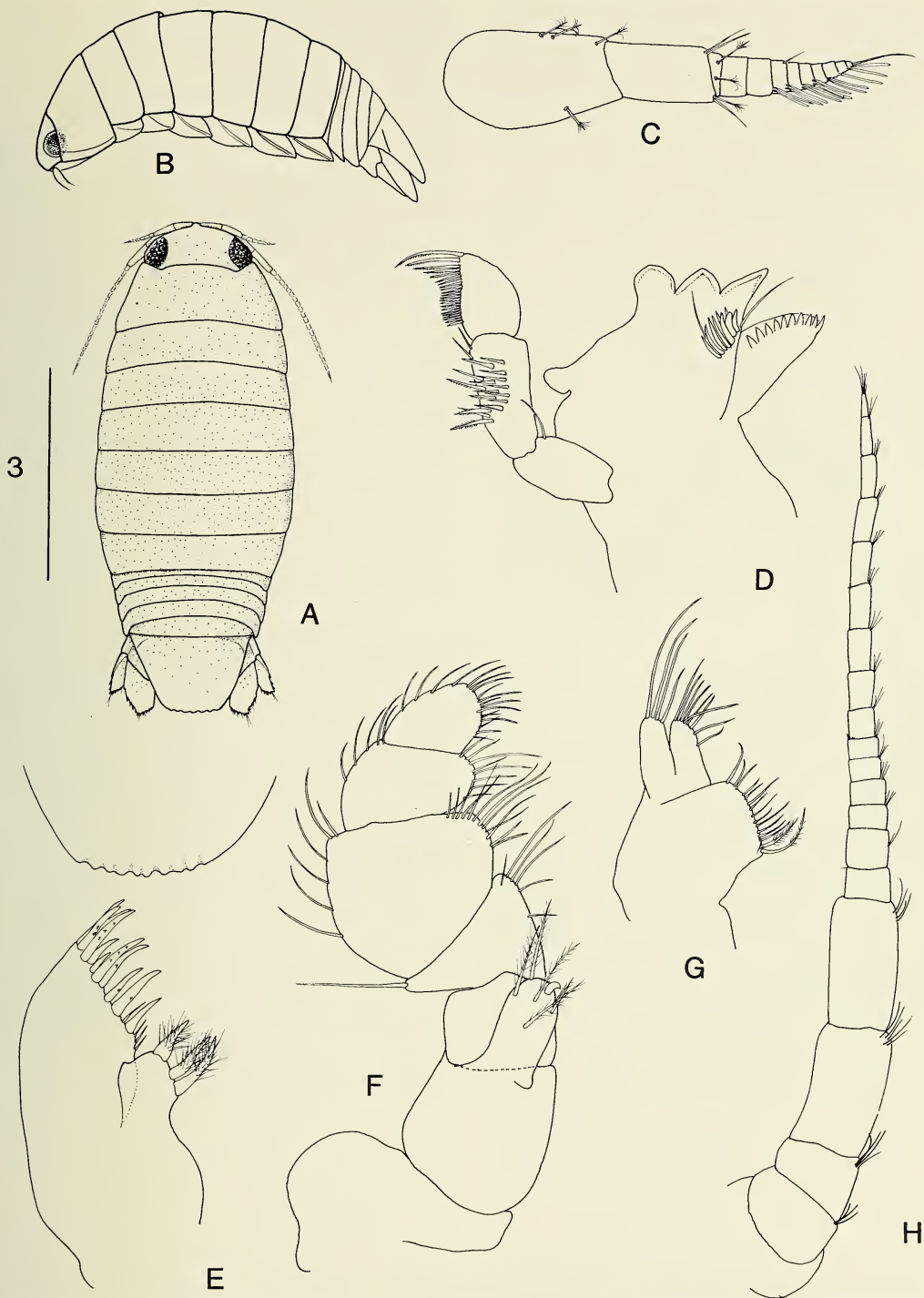


Fig. 15. *Cirolana crenulitelson*: A, Adult in dorsal view; B, Adult in lateral view; C, Antennule; D, Mandible; E, Maxilla 1; F, Maxilliped; G, Maxilla 2; H, Antenna.

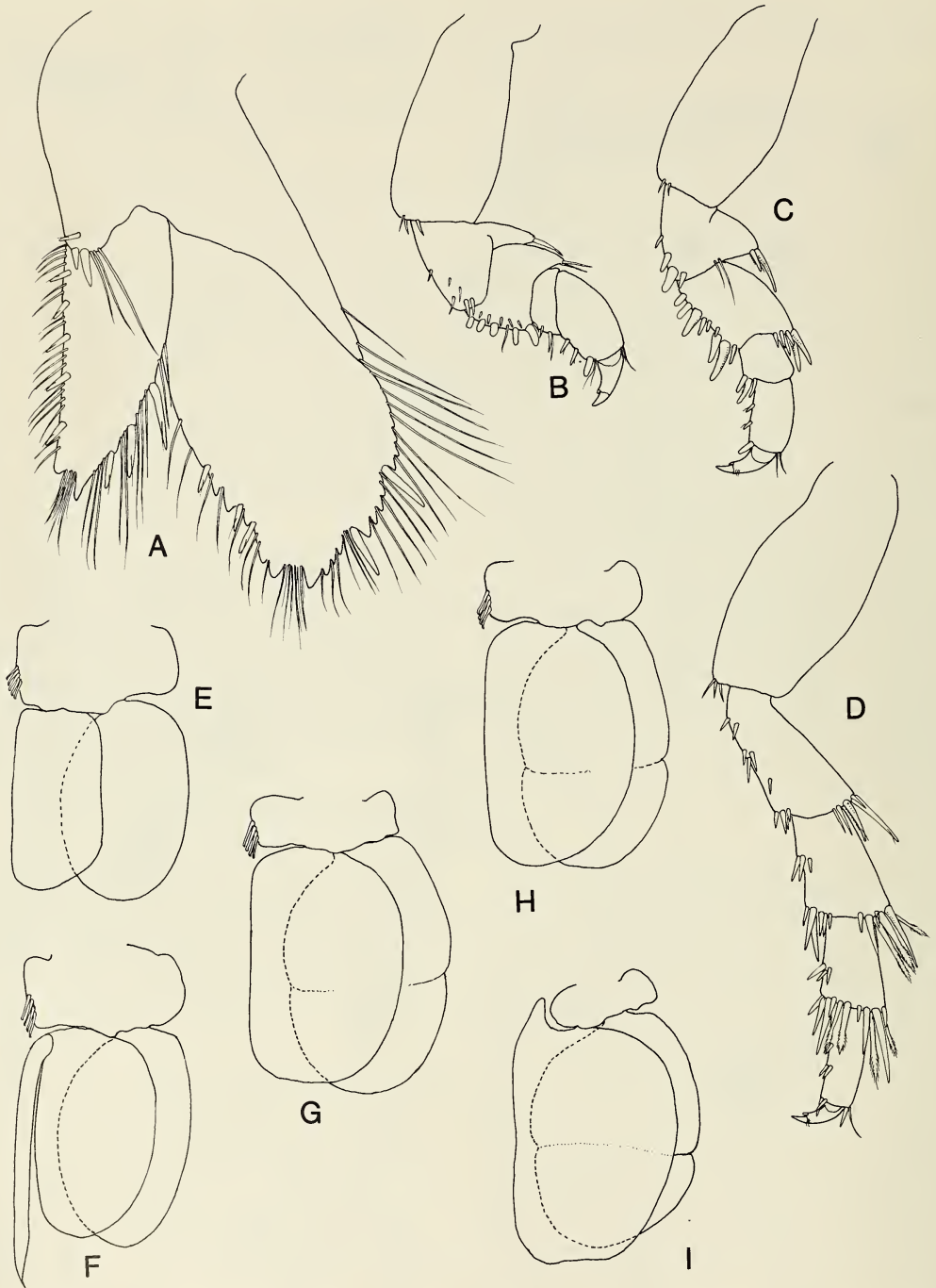


Fig. 16. *Cirolana crenulitelson*: A, Uropod; B, Pereopod 1; C, Pereopod 2; D, Pereopod 7; E, Pleopod 1; F, Pleopod 2; G, Pleopod 3; H, Pleopod 4; I, Pleopod 5.

of propodus; latter elongate-rectangular, with 3 pairs of small spines on posterior margin; carpus with entire distal margin bearing spines of varying length, some elongate and distally fringed, with group of 3 spines on posterior margin; merus with group of spines at antero- and posterodistal corners, former more elongate, group of 3 spines on posterior margin; ischium with group of anterodistal spines, group of 4 short posterodistal spines and several spines scattered on posterior margin.

Pleopods with all rami bearing marginal plumose setae. Pleopod 1 peduncle roughly rectangular, with 5 coupling hooks; endopod parallel-sided in proximal half; exopod ovate. Pleopod 2, peduncle with 4 coupling hooks; endopod with basally articulating copulatory stylet reaching by $\frac{1}{4}$ its length beyond rami, apically acute. Pleopods 3–5, exopods with indistinct transverse articulation at about midlength.

Uropodal exopod tapering, elongate-triangular, with 5 sensory spines on outer margin, 3 spines on medial margin, apically bifid, with short rounded tooth and longer acute tooth; endopod broad, somewhat tapering, with 3 spines on medial margin, 2 spines on outer margin, both margins with irregular serrations between spines, apically bifid, with 2 subequal triangular teeth.

Remarks.—The present species bears a close superficial similarity to *Cirolana obtruncata* Richardson, 1901, recorded from Jamaica, and Puerto Rico. Examination of the holotype of this species, as well as material from Puerto Rico and the Gulf of Mexico reveal several consistent differences. These include the posterior margin of the telson, which in *C. crenulitelson* is clearly crenulate, but entire in the earlier species; Richardson (1905:108, fig. 87b) figures spines on the posterior margin of the telson; these are not present in *C. crenulitelson*. The uropodal rami are distally broadly rounded in *C. obtruncata*, but tapering, marginally serrate, and distally acute-

bifid in *C. crenulitelson*. The overall size of the two species also differs: *C. crenulitelson* ovig. ♀ 6.2–6.8 mm, *C. obtruncata* ♀ up to 11.2 mm. The antennular flagellum has two fewer articles, the antennal flagellum six fewer articles in *C. crenulitelson*.

Etymology.—The specific name refers to the faint crenulations on the posterior margin of the telson.

Family Sphaeromatidae

Ancinus belizensis, new species

Figs. 17A, B, 18, 19

Material.—HOLOTYPE, USNM 211401, ♀ tl 2.8 mm; sta CBC-K-153, near Colson Point, north of Dangriga, Belize, sweepings in seagrass beds, 0.5 m, 20 Nov 1985.

PARATYPES, USNM 211402, 2 ♂ tl 4.1, 4.1 mm, 2 juvs. tl 2.4, 2.0 mm; sta AC-CBC-600, between Colson Point and Salt Creek, north of Dangriga, Belize, sweepings in seagrass beds, 0.1–0.2 m, 7 Jun 1981, coll. A. Cohen.

Description.—Male: Dorsal integument, especially of cephalon and pleon strongly pitted. Cephalon narrower than pereonites, line of fusion with pereonite 1 marked dorsally by impressed line; rostrum anteriorly rounded, about two-thirds middorsal length of rest of cephalon. Pereonites all of equal width; coxae in dorsal view becoming more elongate posteriorly, except for that of pereonite 7, latter shorter than preceding coxa. Pleon somewhat inflated, lateral margins convex, curled ventrally; posterior margin (apex of triangular pleon) narrowly truncate.

Antennule with basal peduncular article flexed at right angle, article 3 twice length of, but narrower than, article 2; flagellum of 12 articles, single aesthetasc on 7 distal articles. Antennal peduncular articles increasing in length distally, flagellum of 10 articles, numerous brush setae on anterior (medial) surfaces of peduncular and 4 proximal flagellar articles. Mandibular palp of 3 articles, article 2 about twice length of article 3, bearing 8 fringed spines; article 3

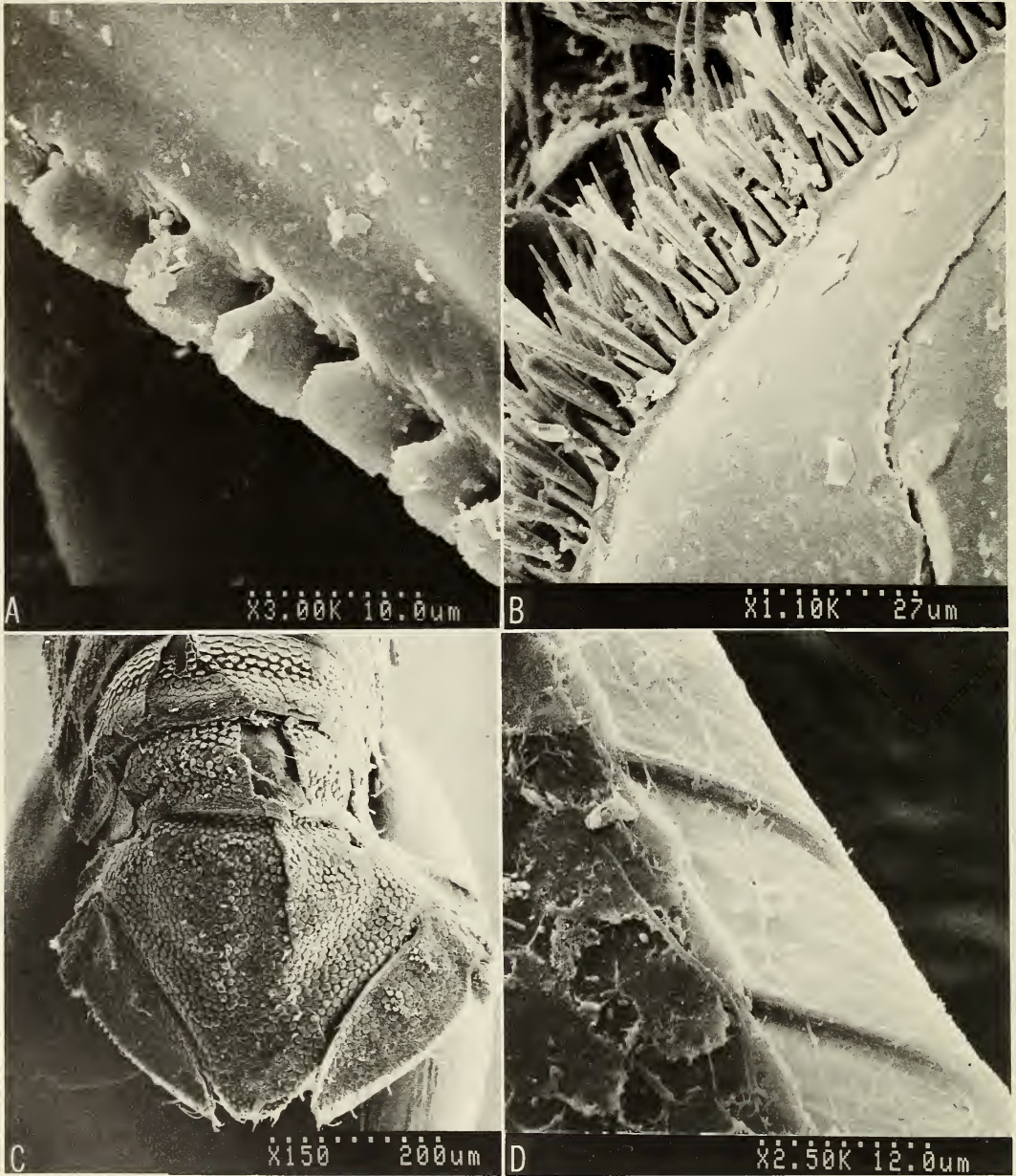


Fig. 17. *Ancinus belizensis*: A, Pereopod 1, tubercles of proximal cutting edge; B, Pereopod 1, spination of propodal margin. *Casidinidea mosaica*: C, Pleotelson in dorsal view; D, Fused setal fringe of uropod.

curved, bearing 5 fringed spines in distal half; left mandibular incisor of 3 sclerotized and 2 non-sclerotized cusps; lacinia mobilis non-sclerotized, with 2 distal cusps; spine row represented by single stout serrate spine.

Right mandibular incisor as in left, lacinia mobilis with 2 sclerotized cusps; spine row with 2 serrate spines. Maxilla 1, outer ramus bearing 4 stout serrate spines and 8 smaller and more slender simple spines distally.

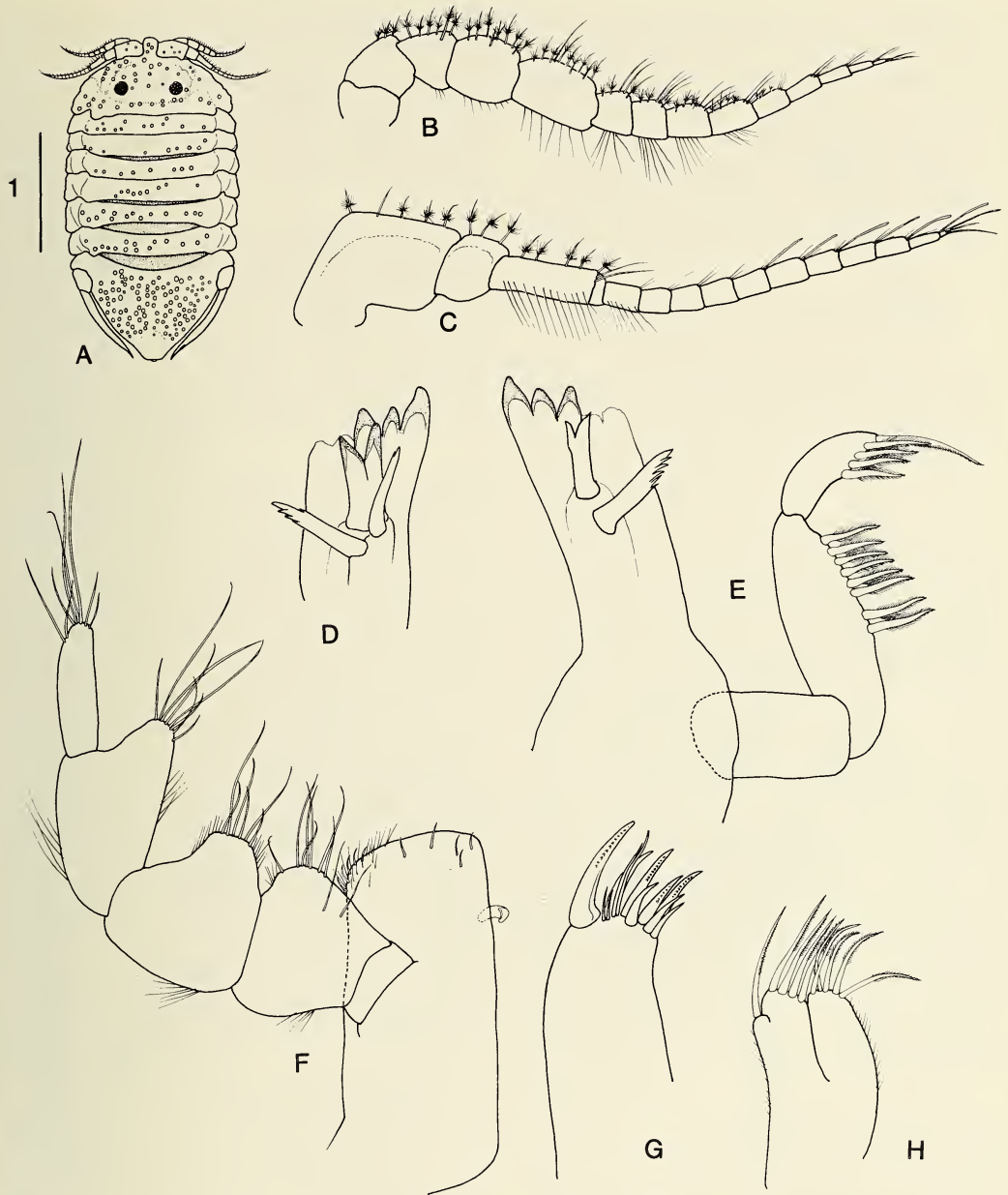


Fig. 18. *Ancinus belizensis*: A, Adult in dorsal view; B, Antenna; C, Antennule; D, Distal part of right mandible; E, Left mandible; F, Maxilliped; G, Maxilla 1; H, Maxilla 2.

Maxilla 2, inner ramus with 5 elongate fringed distal setae; outer ramus with 4 distal fringed setae, plus single setae on rudimentary outer lobe. Maxillipedal endite distally bluntly rounded to subtruncate; single

retinaculum on medial margin; basal palp article short, $2\frac{1}{2}$ times wider than long; articles 2-5 bearing elongate simple setae on anterior (medial) lobed margins; terminal article slender, $3\frac{1}{2}$ times longer than broad.

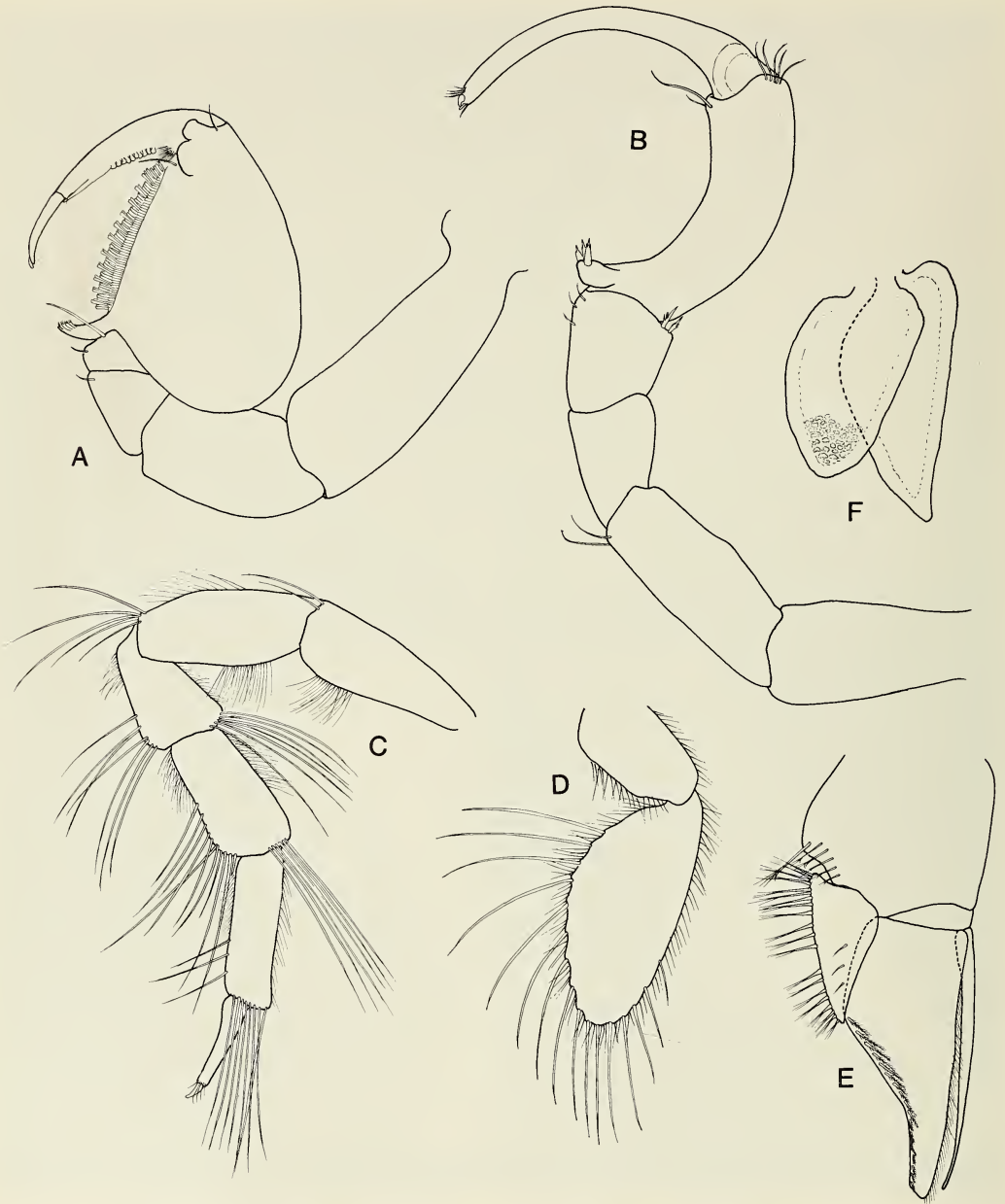


Fig. 19. *Ancinus belizensis* ♂: A, Pereopod 1; B, Pereopod 2; C, Pereopod 7; D, Pleopod 1; E, Pleopod 2; F, Pleopod 3.

Pereopod 1, unguis about half length of rest of dactyl, with elongate accessory spine at base; proximal half of dactyl bearing row of rounded scales on posterior margin; propodus proximally inflated; palm bearing

series of densely-packed long and short distally widened setae; proximal digitiform process curved, reaching beyond carpus. Pereopod 2, dactyl elongate, curved, tip reaching proximal lobe of propodus, latter

bearing 3 stubby spines; propodus strongly curved, palm strongly concave. Pereopod 7, dactyl $\frac{2}{3}$ length of propodus; latter parallel-sided, with about 8 elongate setae on distal margin; carpus, merus, and ischium each bearing elongate setae on antero- and posterodistal margins.

Pleopod 2, exopod triangular, less than half length of distally tapered endopod; copulatory stylet elongate-slender, just falling short of apex of endopod. Pleopods 3–5 typical of genus. Uropodal ramus reaching to pleotelsonic apex, tapering, following lateral margin of pleotelson closely, with faint distal flexure.

Remarks.—The present species differs from the five species discussed by Glynn and Glynn (1974) in several features:

In *A. panamensis* Glynn & Glynn, 1974, from Pacific Panama and Colombia, the dactyl of pereopod 2 of the male is short and closes on the propodus; in *A. belizensis* the dactyl closes (i.e., the apex reaches) the carpus. The antennular flagellum has 13 articles, the antennal flagellum nine (*A. belizensis*: 12 and 10 articles, resp.). The proximal digitiform process of pereopod 1 in the male is short (relatively elongate in *A. belizensis*). The two distal articles of the mandibular palp bear 9 and 10 setae as against 8 and 5 in *A. belizensis*. The coarse and obvious integumental pitting of the latter species is distinctive; the pitting in *A. panamensis* is finer and less obvious (see Brusca and Iverson 1985).

In *A. brasiliensis* Lemos de Castro, 1959, the pleotelson is as long as its basal width, and apically narrowly truncate; in *A. belizensis* the pleotelson is wider than long, more broadly truncate, and the dactyl of pereopod 2 of the male is relatively longer, reaching to the midlength of the carpus; the antennular flagellum has 14–16 articles, the antennal flagellum 8–10 articles.

Ancinus granulatus Holmes & Gay, 1909, of California (with its synonym *S. seticornus* Frask, 1970), has a densely granulate integument.

Ancinus depressus (Say, 1818) of the east coast of the U.S.A. and Gulf of Mexico is a large species (at least three times longer than *A. belizensis*), having the uropodal ramus distinctly shorter than the pleotelson.

Etymology.—The specific name refers to the country of Belize, where the present species, as well as several others in this paper, was collected.

Cassidinidea mosaica, new species
Figs. 17C, D, 20, 21

Material.—HOLOTYPE, USNM 211403, ♂ tl 1.8 mm; sta CBC-K-158, Carrie Bow Cay, Belize, rubble and coarse sediments at base of spur and groove buttress, 8–10 m, 24 Nov 1985.

PARATYPES, USNM 211404, 10 specimens (incl. 1 ovig. ♀ tl 1.6 mm); same data as holotype.—USNM 211405, 15 specimens (incl. 3 ovig. ♀ tl 1.5 mm); sta CBC-AC-610-B, Carrie Bow Cay, Belize, silty sand from patch reefs, 1.5 m, 14 Jun 1981, coll. A. Cohen.

Description.—Body oval in outline, about twice longer than wide. Dorsal integument finely tuberculate. Lateral margins fringed with transparent setose flange. Cephalon embedded in pereonite 1; eyes dorsal, well pigmented. Pereonites 2–7 subequal in length and width. Pleonite 1 free, middorsally somewhat inflated, with free lateral margin. Pleotelson triangular, basally slightly inflated, posteriorly apex narrowly rounded. Frontal lamina visible between antennal bases.

Basal antennular peduncle article flexed, rest of appendage directed laterally; 2 distal peduncular articles becoming progressively shorter; flagellum of 3 articles, distal article bearing single aesthetasc. Antennal peduncular articles becoming progressively longer distally; flagellum of 7 setose articles. Mandible with strong dentate molar, 4 spines in spine-row, 3 cusps in incisor; palp of 3 articles, article 2 with 2 distal fringed spines, article 3 with 5 distal fringed spines. Maxilla 1, inner ramus with 4 fringed setae, outer

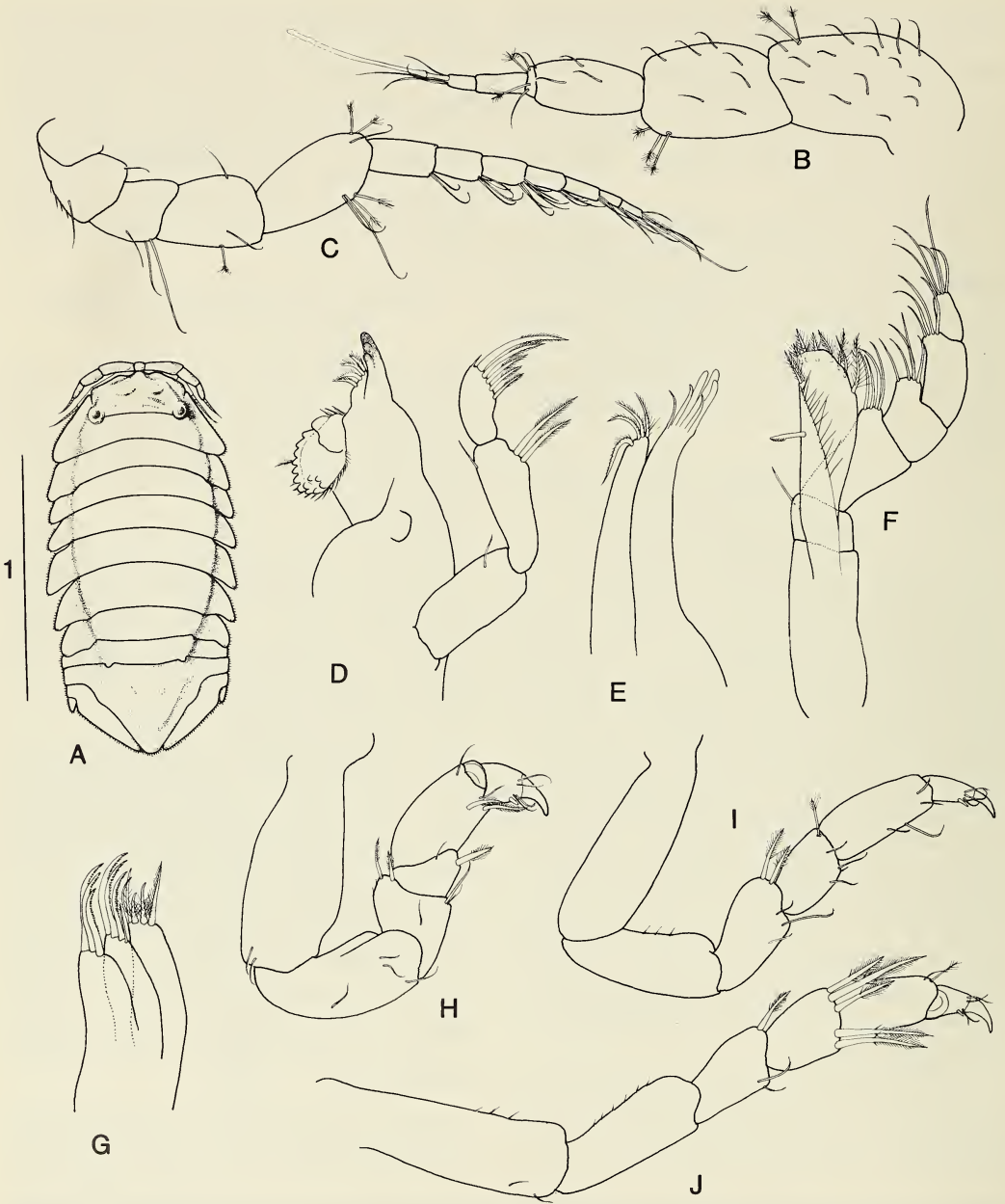


Fig. 20. *Cassidinidea mosaica*: A, Adult in dorsal view; B, Antennule; C, Antenna; D, Mandible; E, Maxilla 1; F, Maxilliped; G, Maxilla 2; H, Pereopod 1; I, Pereopod 2; J, Pereopod 7.

ramus with 3 broad and 3 slender distal spines. Maxilla 2, inner ramus with 5 distal fringed spines; inner lobe of outer ramus with 3 dentate spines and 1 simple spine, outer lobe with 3 dentate spines. Maxillipedal endite reaching to article 4 of palp,

distally rounded, with single retinaculum on median margin, several short fringed spines distally; palp articles 2–5 with several simple setae on low inner distal lobe.

Pereopods becoming progressively longer posteriorly. Pereopod 1 with unguis equal

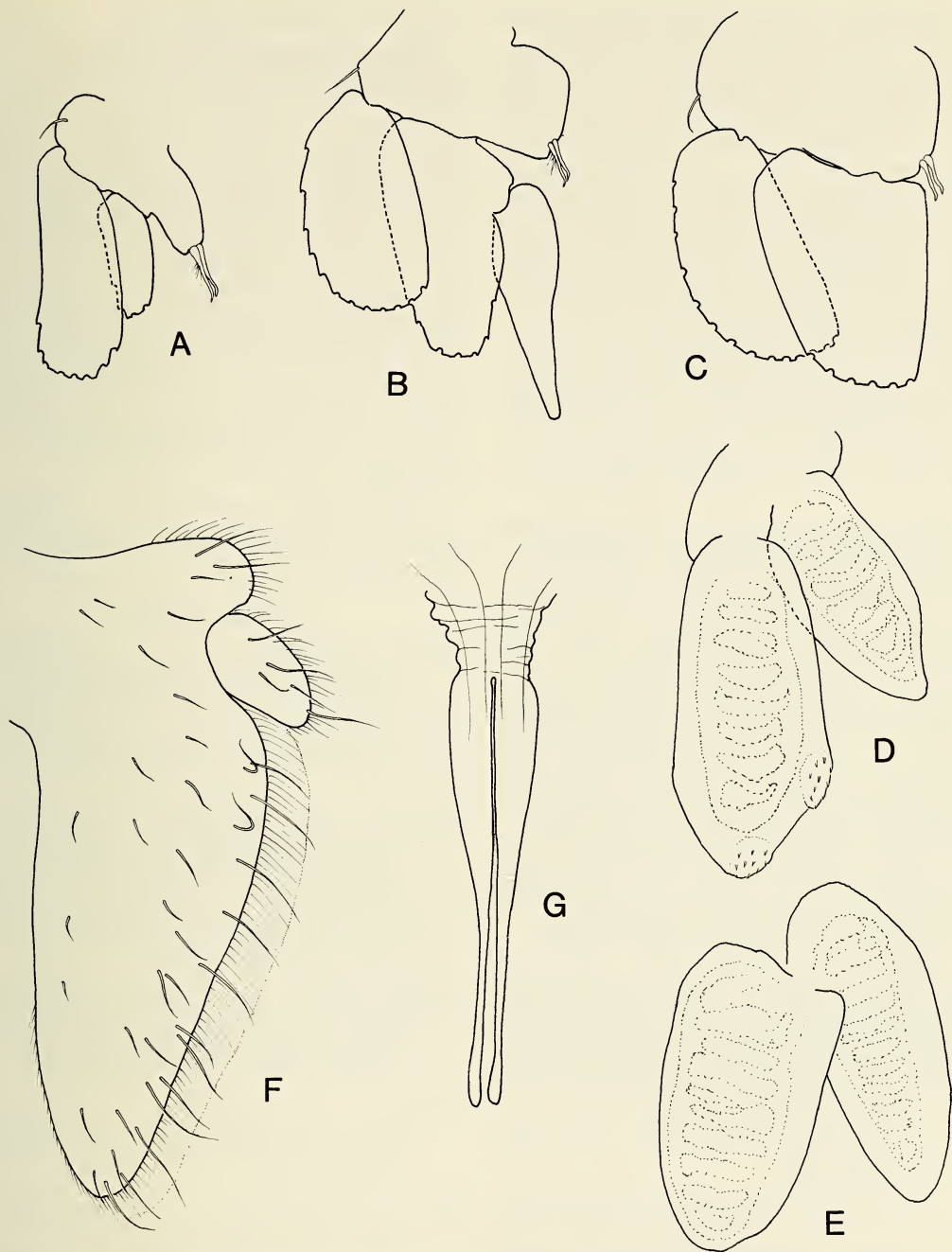


Fig. 21. *Cassidinidea mosaica* ♂: A, Pleopod 3; B, Pleopod 2; C, Pleopod 1; D, Pleopod 4; E, Pleopod 5; F, Uropod; G, Penis.

in length to rest of squat dactyl; propodus with 2 posterodistal spines; carpus triangular, with single posterodistal spine; merus with 2 anterodistal spines. Pereopod 2, dac-

tyl less squat than that of pereopod 1, propodus and carpus lacking spines. Pereopod 7, carpus rectangular with 2 posterodistal, and 3 anterodistal stout fringed spines.

Penile rami basally fused, distally with 2 slender elongate rami. Pleopod 1 in male, basis broad, with 2 retinacula; endopod basally broad, distally tapering, longer than ovate and narrower exopod. Pleopod 2 in male, both rami ovate; copulatory stylet attached basally to endopod, basally broad, tapering distally, extending well beyond rami. Pleopod 3, basis produced mesially into lobe bearing 2 retinacula; endopod elongate-ovate, half length and width of exopod. Pleopod 4, both rami well developed, pleated. Pleopod 5, exopod $\frac{2}{3}$ length of, and narrower than, exopod. Uropodal basis and endopod fused, almost reaching pleotelsonic apex, distally rounded; exopod short, ovate.

Remarks.—Menzies & Frankenberg (1966) regarded *Dies* and *Cassidinidea* as synonymous, but noted the single penis of the former and the double structure of the latter. Carvacho (1977) disagreed with Menzies & Frankenberg, maintaining that the genital structure required separation of the two genera. He further characterized *Dies* as being estuarine, *Cassidinidea* as truly marine. Heard (1982), however, recorded *C. ovalis* from the northeastern Gulf of Mexico, from salinities of <1‰–20‰, i.e., truly estuarine. Loyola e Silva (1960) also characterized *Dies* as having a single penis.

Cassidinidea mosaica differs from *C. ovalis* (Say, 1818) (= *C. lunifrons* (Richardson, 1905), see Schultz 1978, Heard 1982) known from New Jersey to Florida, in having a rounded posterior pleotelsonic margin, in being a smaller species (ovig. ♀ 1.5–1.6 mm), and in having a finely tuberculate dorsal integument.

Cassidinidea tuberculata Richardson, 1912, from Mexico, Brazil, Argentina (see Pires 1982), has a relatively larger uropodal exopod, a less ovate body outline, and a larger body-size (♀ tl 5.1 mm).

Etymology.—The specific name refers to the dorsal integument especially of the pleotelson, which resembles the closely-set tesserae of a mosaic (see Fig. 17).

Acknowledgments

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